SIEMENS

SIREMOBIL Compact

SP

System manual

Function Description

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Variations

The SIREMOBIL Compact is available with a 7" or a 9" image intensifier. You can select from among three different image memories: MEMOSKOP C, MEMOSKOP C-E and the MEMOSKOP C-SUB**. The monitor trolley is available in several versions. It can be equipped with one or two 50Hz / 60Hz monitors or 100Hz /120Hz monitors. M44 or Simomed 90 N monitors may be used.

Optional accessories are:

- Laser targeting device
- Area dose product measurement device
- Multiformat camera
- Video printer
- Video recorder

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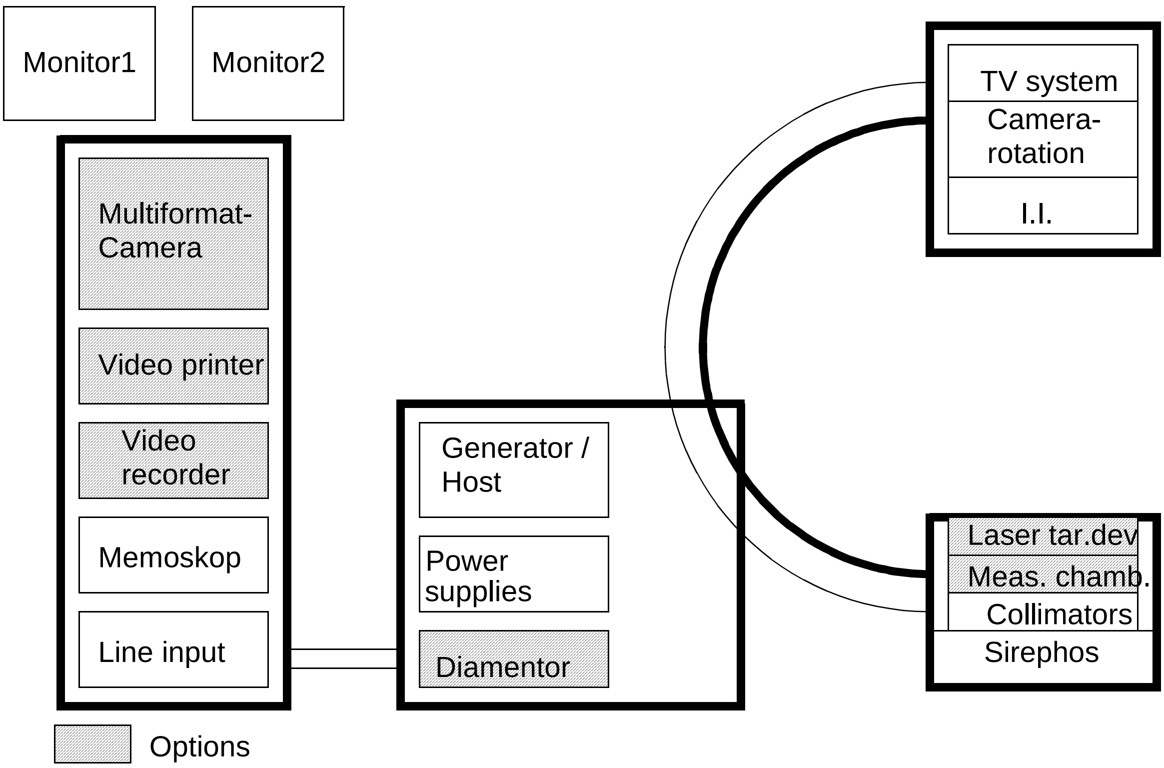


** Not available as of this printing!

System data

Connection data

The SIREMOBIL Compact can be connected to line voltages of:

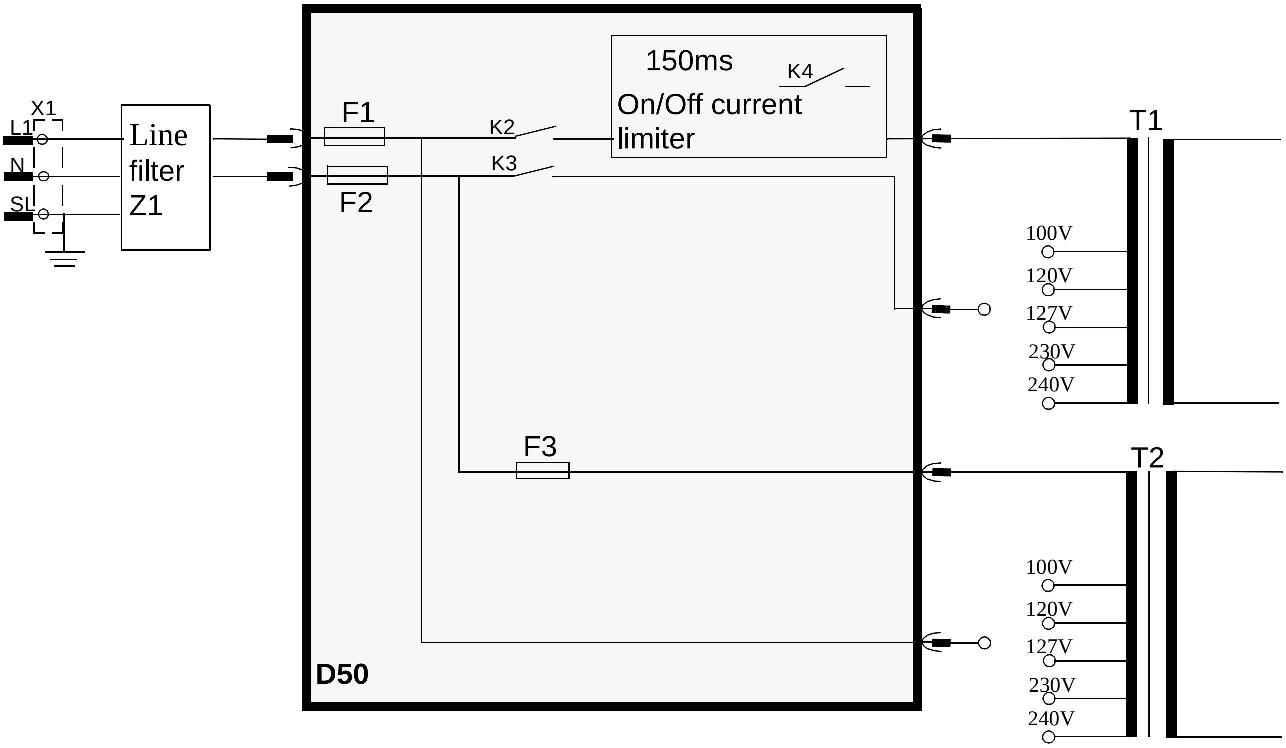
- **100V, 120V, 127V**, at an internal line impedance of **≤ 0.3 ohm** and
- **230V 240V** at an internal line impedance of **≤ 0.8 ohm**.

The power consumption is **1.65 KVA** can, however, reach **2.9 KVA** for short periods of time.

Service philosophy

Service for the SIREMOBIL Compact is restricted to board replacement. Few or no adjustments are required when replacing a board. If the image memory malfunctions, it must be completely replaced.

Input line circuit



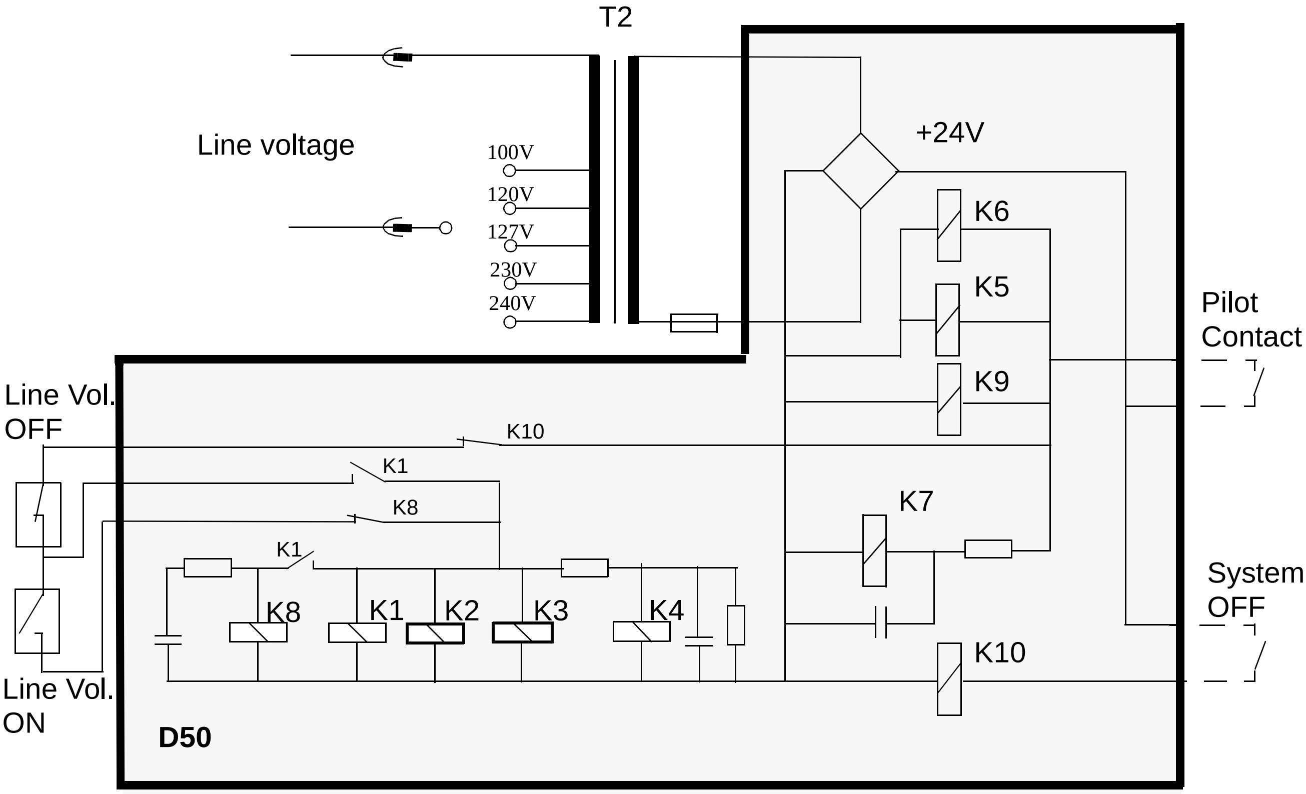
After connecting the system to the line voltage, the auxiliary transformer T2 is immediately supplied with voltage and delivers 19V ~ to the switch-on circuit.

The power transformer T1 is powered up when the SIREMOBIL Compact is switched on and relays K2 and K3 are energized. After switching the line voltage ON, the power-on current is limited immediately for a period of 150ms to protect the fuses from the power-on current surge.

The line filter Z1 in the input circuit suppresses any interference superimposed from the line voltage supply or from the SIREMOBIL Compact.

The main system fuses are located behind the line filter. The SIREMOBIL Compact is supplied with 20A slow-blow fuses for line voltages of up to 127 V~ and15 A slow-blow fuses for line voltages of 230V~ and up.

Switch-on circuit



Relay function K1, K2, K3 / Switch-on relays

The switch for line voltage ON in the monitory trolley must be activated in order for the system to switch on. Relays K1,K2 and K3 switch on immediately and K4 is delayed. The K1 relay contact bypasses the line voltage ON switch so that the system remains switched on when the switch is no longer pressed (latching). Relay contacts K2 and K3 forward the line voltage to power transformer T1.

K4 relay function / Current limiter

The K4 relay switches on 150ms after switching the line voltage ON and bypasses the NTC resistor of the current limiting switch.

K8 relay function / Switch delay

If the line voltage switch is activated, latching is interrupted and relays K1, K2 and K3 immediately switch off. Subsequently, the K8 contact remains open corresponding to the time constant of the parallel RC element, so that the system can be switched back on after only a short delay (approx. 5 seconds).

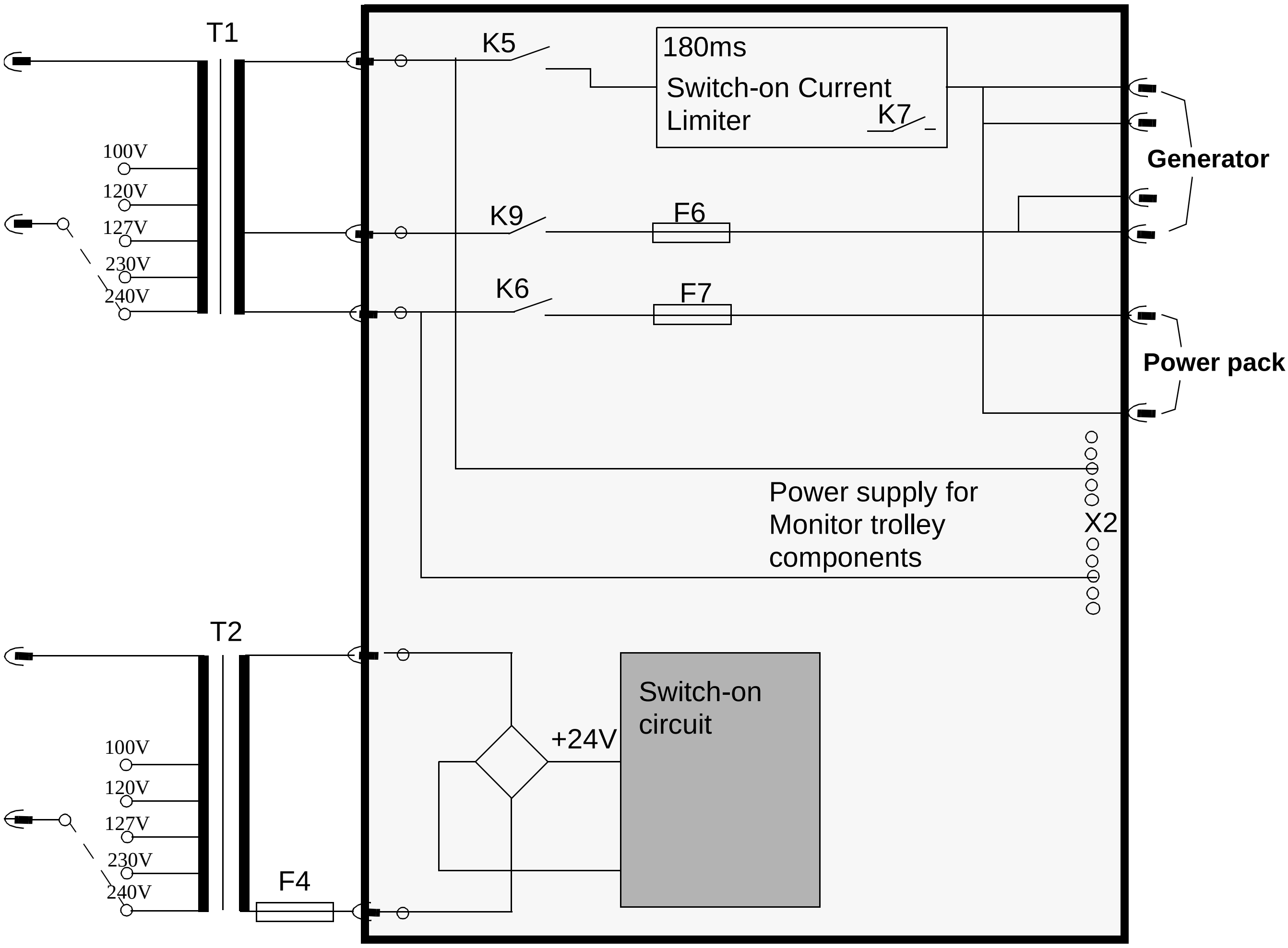
K10 relay function / System OFF

If the system OFF switch is activated at the SIREMOBIL console, the K10 contact opens and interrupts the supply current for switch-on relays K1, K2 and K3.

K5, K6, K7, K9 relay function / Pilot

Relays K5, K6, K7 and K9 switch on only when the monitor cable is connected to the SIREMOBIL cabinet.

Component power supply

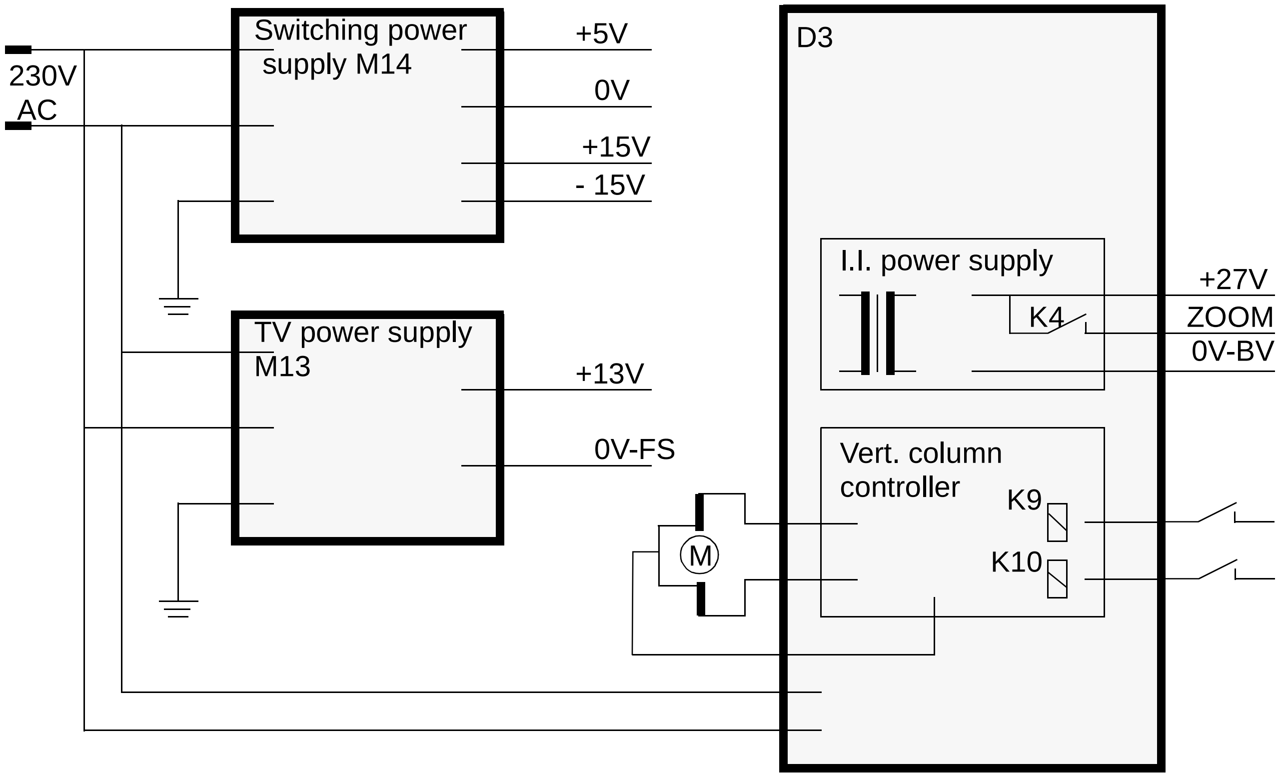


The K5 and K9 relays forward the supply voltage of 190 V~ to the generator if the monitor cable is connected.

An additional current limiter ensures that the current for the generator remains at an acceptable level when the monitor cable is connected. After 180ms, the K7 relay contact bypasses the NTC resistor in the current limiting switch.

The components in the monitor trolley such as the monitors, multiformat camera, video printer, etc., are supplied with power via the X2 connections.

Power supplies in the cabinet



Power supplies M13 and M14 are located in the SIREMOBIL electronics cabinet.

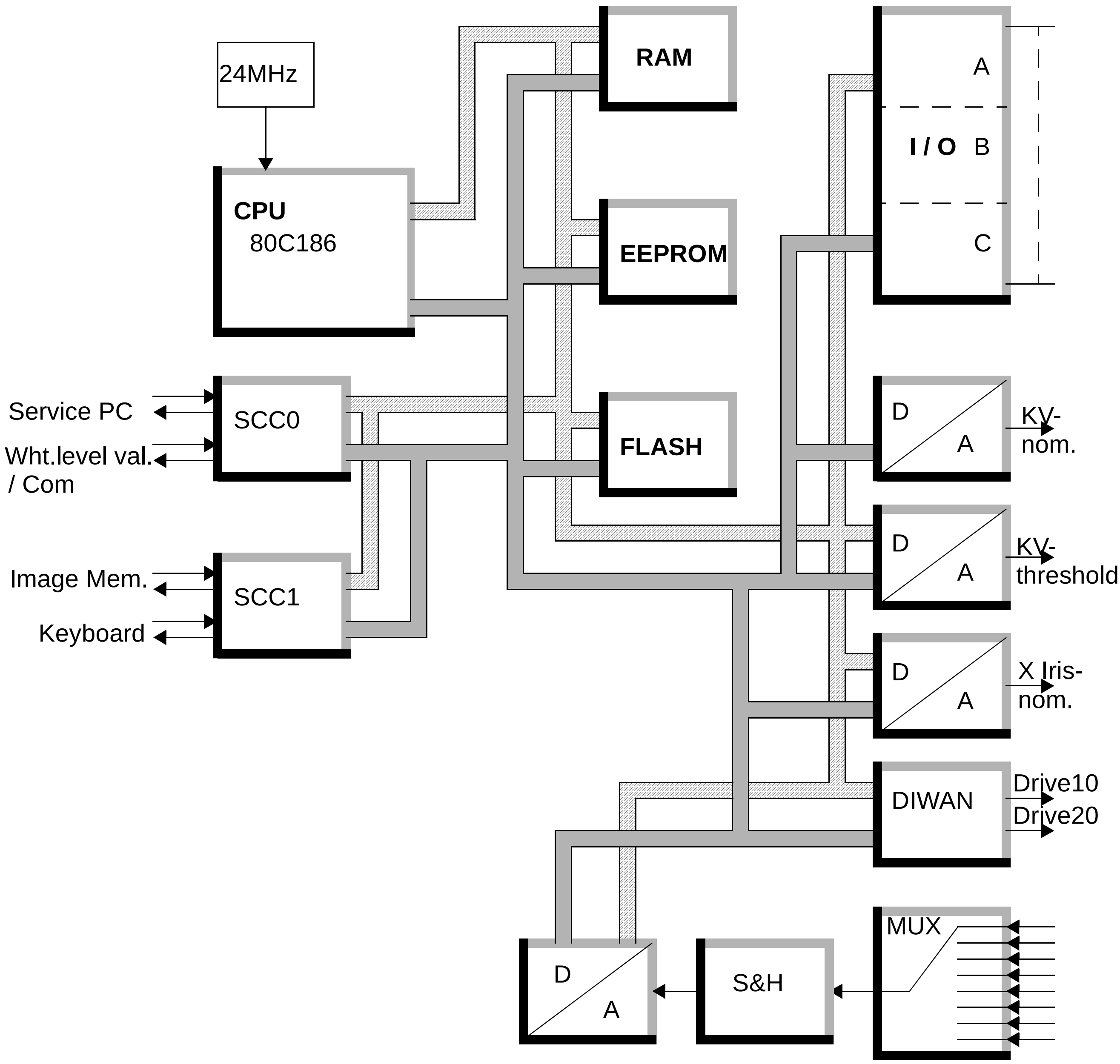
The M14 power supply supplies the system voltages:

+5V	for: D1; D2; D3; control unit; camera rotation; and laser targeting device.
+15V	
	for: D1; D2; D3; Iris collimator and filter collimator.
-15V	

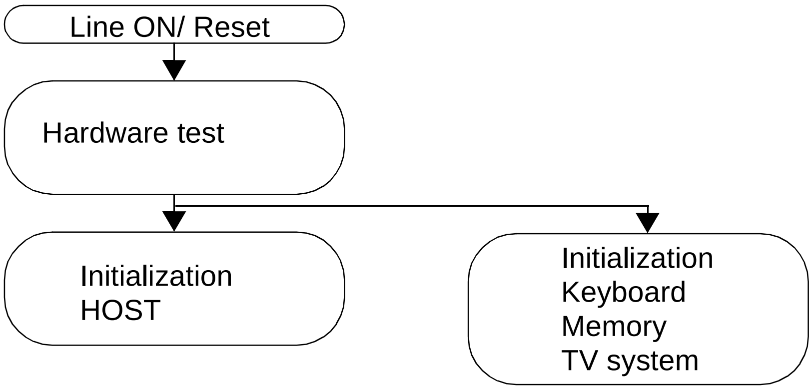
The M13 power supply delivers floating (non-referenced) power for the television system of : +13V /1A

Host computer

The host computer and various generator modules are located on board D1. The host is a computer system based on an 80C186 µC with a system clock of 12MHz. The CPU storage consists of the working memory (RAM), the memory for system parameters (EEPROM) and the memory for the host software (FLASH). Internal communication takes place via I/O components, communication with peripheral system components or with the Service PC via four RS232 interfaces (SCC0 / SCC1), configured as 20 mA circuits. Analog nominal values are output via D/A converters. The analog actual values are selected by an 8:1 multiplexer and subsequently converted to digital values by an A/D converter.



Initialization



The processor performs a self-test after the system has been switched on and the supply voltages have been established. If an error occurs during the self-test, an error message will be displayed on the 7 segment display on board D1. If the self-test is completed successfully, the system is initialized by the host computer. In this process, standard kV and mA values are computed based on the mean value of the characteristic curve selected. However, the displays indicate 0 KV, 0 mA and 0 minutes, etc. System initialization depends on the host downloadsoftware resident in memory. After board D1 runs a self-test, the peripheral system components are initialized. The following sequences will be controlled depending on the results of the self-test.

Service switch and displays on board D1

Service switches S2 and S3 and the reset switch S1 are located on board D1. S2 is a safety switch that blocks radiation release. If S2 is in position 1, radiation release is enabled. Service switch S3 has four switch functions:

S3.1-Reserve

S3.2-Download image memory (center segment of V20 flashes)

S3.3-Download Boot software (status indicator V20 sweeps vertically)

S3-4-Radiation blocked

Test results of the host system are displayed on the V20 indicator as follows:

0--Processor-error D1 1--Checksum-error D1 2--RAM-error D1

4--Watchdog- error 8--Telegram-error, serial Port Service PC

9--Telegram overrun error, Serial Port Service PC

b--Telegram-break error, Serial Port Service PC

C--Telegramm Checksum error, Serial Port Service PC

E--A/D-converter error D1 F--Telegram framing error, serial port Service-PC L--CPU timer error

S--Serial port to Service-PC defective

P--Telegram parity error, serial port Service-PC

The status is briefly displayed during the course of a test routine. If the display stops permanently on an error status after a test, an error has occurred.

rotating left-- Status Boot software

rotating right --Status Host software

(Refer also to Moreinfo Help in the Service Software)

In addition to this, various LED‘s indicating status or errors are located on board D1.

V30 (red) indicates a Timeout Signal when, during a defined period of time, there has been no significant activity of the CPU system. (Watchdogfunction.

V31 (red) indicates that the +/-15V power supply is defective

V32 (red) indicates that the oil pressure switch in the SIREPHOS has responded

V33 (red) glows when the max. high tension has been exceeded

V34 (red) glows when the maximum inverter current has been exceeded

V35 (red) indicates that maximum filament current has been reached

V36 (red) indicates a short circuit in the filament circuit inverter

V52 (green) glows when the radiation iris collimator is activated

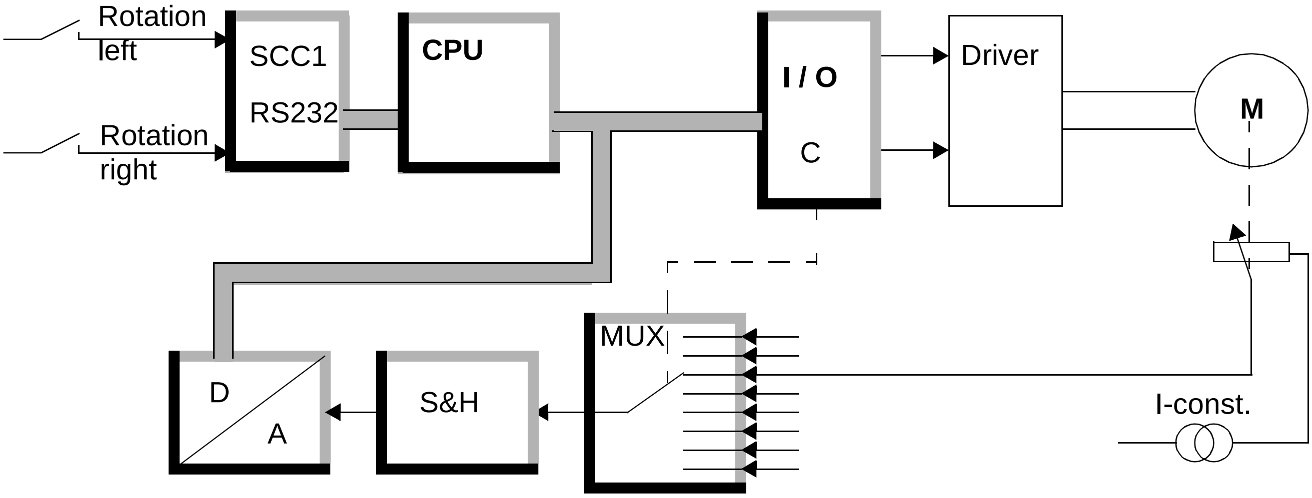
V53 (green) is the signal for ’radiation requested’

V54 (green) is the feedback signal for ’radiation requested’

V85 (green) glows when radiation is released with switch S2 (SS)

V91 (green) indicates that the +5V power supply is available

Camera rotation

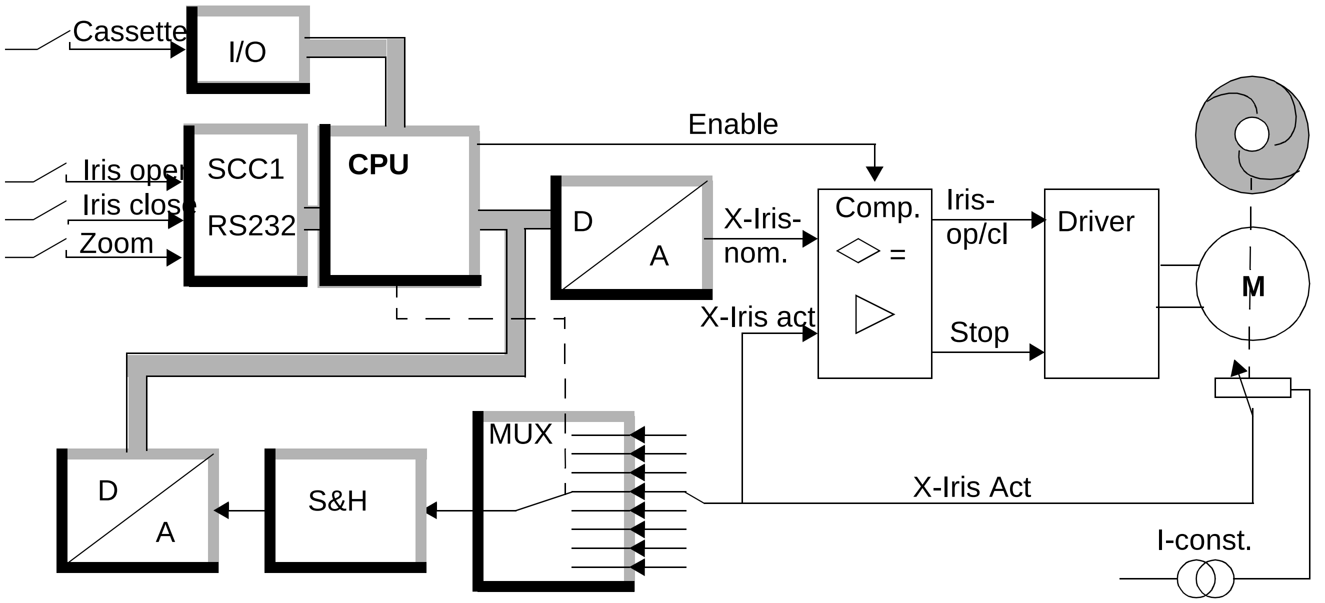


The left or right rotation keys control the rotation direction for the CCD camera. The motor is controlled via a driver and turns the CCD camera with the optics. A mechanically connected potentiometer provides the actual value of the camera position. This actual value is forwarded via a multiplexer to the CPU controller, stored intermediately in an S&H stage and then converted to a digital value. The CPU compares the actual value with the nominal value resulting from actuation of the rotation direction keys or from stored nominal values, according to operating mode. In addition, the camera position indicator generates an orientation marker from the actual value signal which is superimposed in the monitor image when radiation is switched ON.

The CCD camera can be set within a range of +220° to -220° +/-2°.

Collimator control

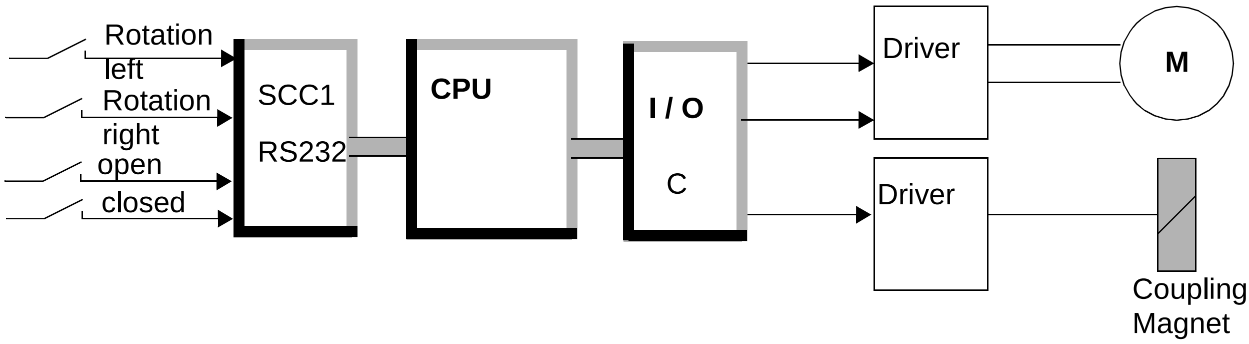
X-Iris control



The X-Iris has a motorized control system which responds to the selection of control keys Iris open / Iris closed or the I.I. format / cassette format. The drive motor is mechanically coupled to the Iris collimator and an actual value potentiometer to acquire the position of the iris collimator. This actual value is forwarded to the comparator. In addition, it is transmitted via a multiplexer to the CPU, intermediately stored in the S&H stage and converted to a digital value with an A/D converter. The CPU delivers a digital nominal value, converted by the D/A and transmitted to the comparator, where the nominal and actual values are compared. If the difference of the two values exceeds a certain amount, the collimator motor is engaged. As long as the nominal value equals the actual value, the collimator motor will remain blocked and the collimator will remain stationary. The enable signal from the CPU releases the motor control.

The X-Iris can be opened to maximum aperture for the selected I.I. format (survey or zoom) during Fluoroscopy or Digital Radiography. It is normally opened to maximum aperture in exposure mode. Only when both X Iris keys (open / close) are pressed simultaneously in FL / DR mode, will the X Iris collimator move into position for exposure mode. The LED in the Iris collimator OPEN key glows when the iris collimator is opened to maximum aperture.

Slot diaphragm control



The filter collimator can be opened and closed with the corresponding keys. The collimator blades can be moved symmetrically into the center. In exposure mode, the collimator blades are moved into a park position outside the exposure format. When current is switched ON, the collimator blades are opened.

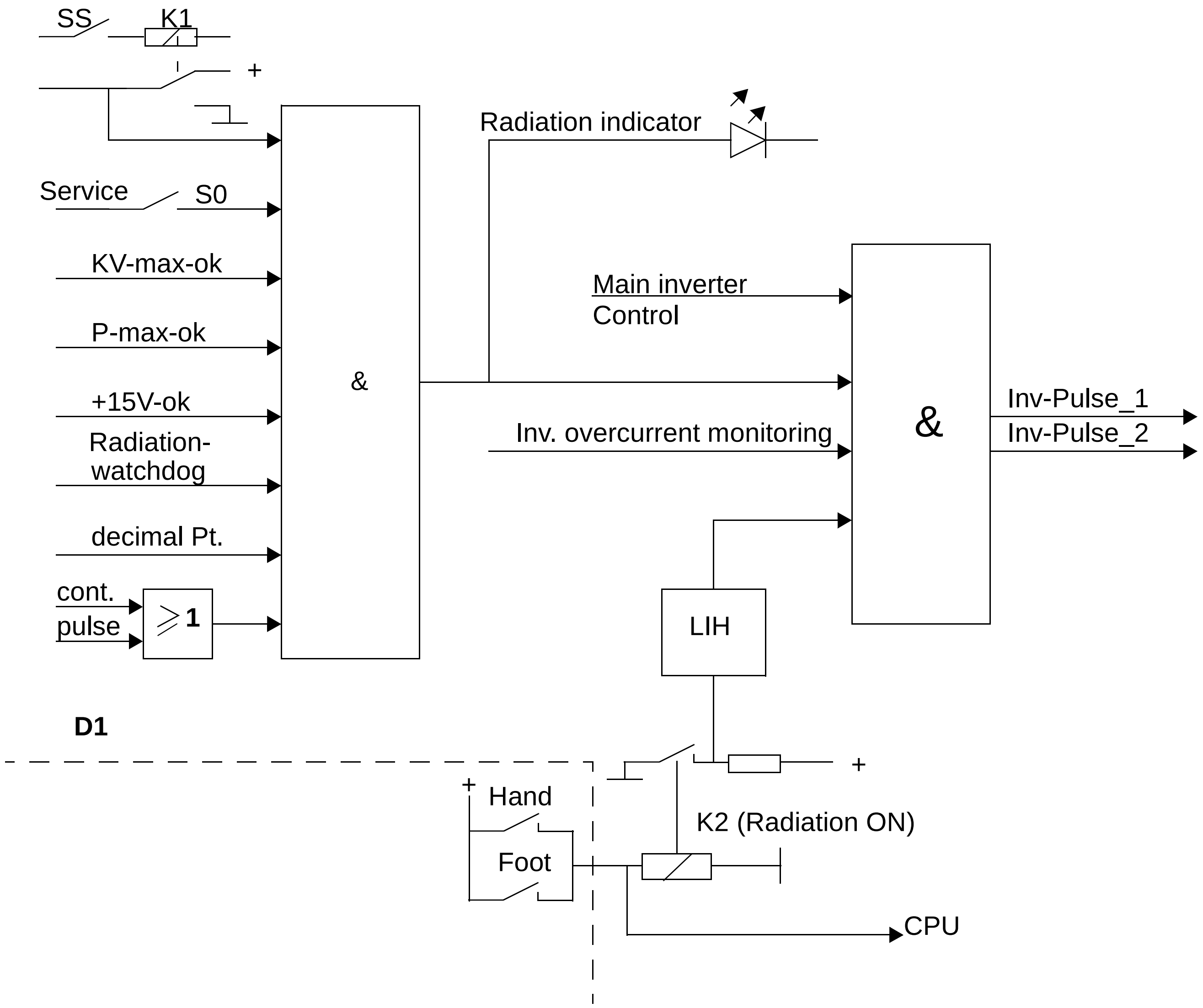
The motor and the coupling magnet are controlled simultaneously when the collimator blades are opened and closed. The coupling magnet reverses the mechanical control, so that the filter collimator opens or closes as required.

Collimator for cassette format

A permanently installed collimator is used for the 24*30 format in exposure mode. The I.I. format is not compromised by the exposure collimator. The position of the exposure collimator is also fixed, because the position of the cassette holder is defined according to the position of the patient longitudinal axis. In general, the X Iris collimator and the filter collimator are opened to maximum aperture in exposure mode. If, however, both keys for the respective collimator function are activated simultaneously prior to inserting the cassette, the collimator will retain its setting.

Radiation release

Block circuit diagram



Various conditions must be satisfied for the control signals to be released for the inverter or for radiation to be released. Signals such as KV-max, Sirephos over pressure, supply voltages, radiation watchdog and inverter overcurrent monitoring are polled. For service purposes, radiation can be blocked with (SS) switch S2 via the K1 relay.

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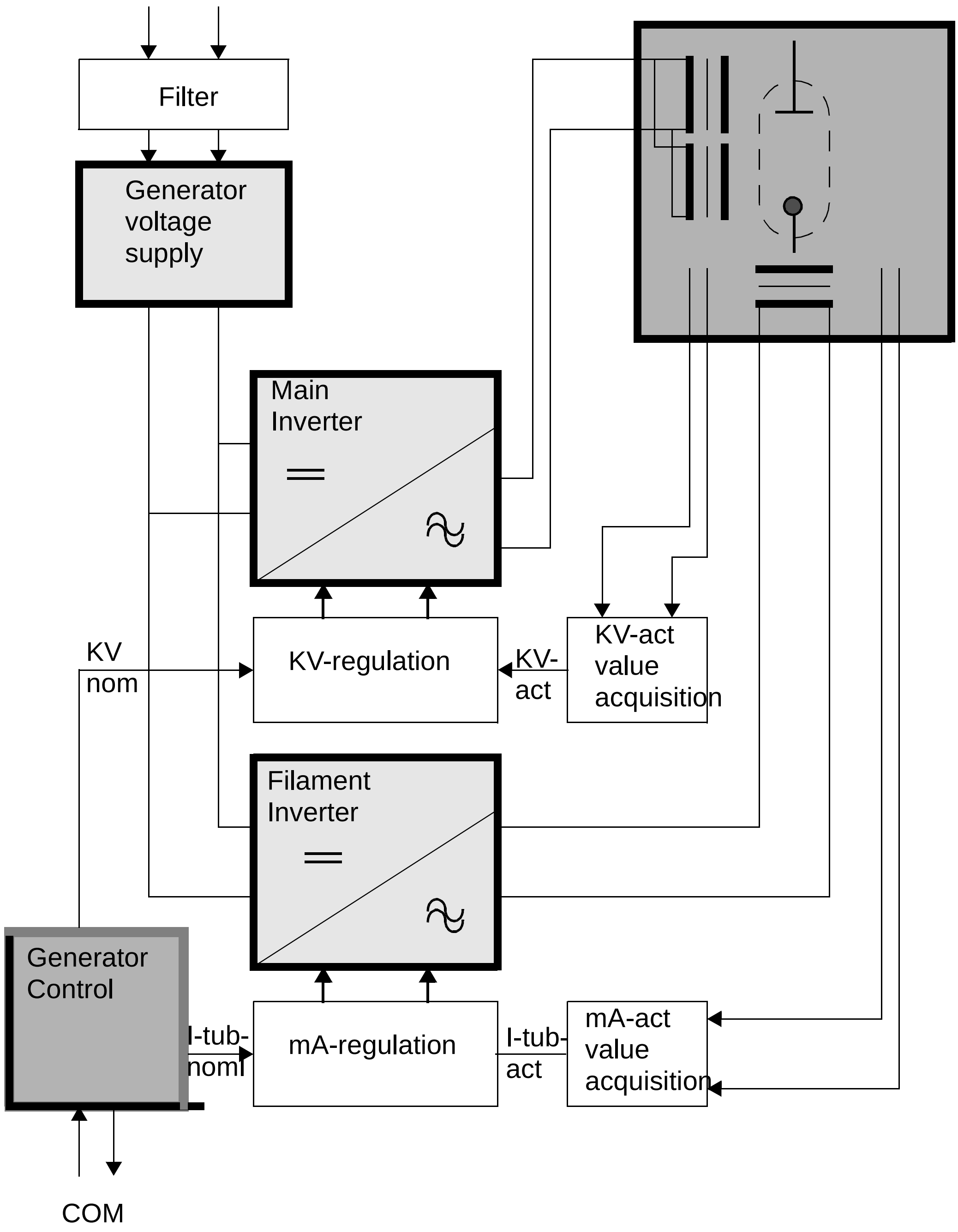
Overview

The generator is located on boards D1 and D2 in the basic system. Board D1 contains the SIREMOBIL controller (HOST) and the generator modules for controlling the power components for high voltage generation and the filament circuit.

Generator block diagram



Generator- Voltage Supply

The generator is supplied with 190V of AC voltage from transformer T1 when the monitor trolley cable is connected. The voltages:

+5V DC voltage for the digital assembly components

+/- 15V for the analog components

are supplied by the M14 power supply as well.

Intermediate Circuit

The 190V AC voltage goes from transformer T1 via a line filter (EMC) to output module D2. In this process, the AC voltage is rectified and charges the capacitor pack C403 to C406. Once this happens, a stable intermediate circuit voltage of 266V +/-10% is available for the main and filament inverters.

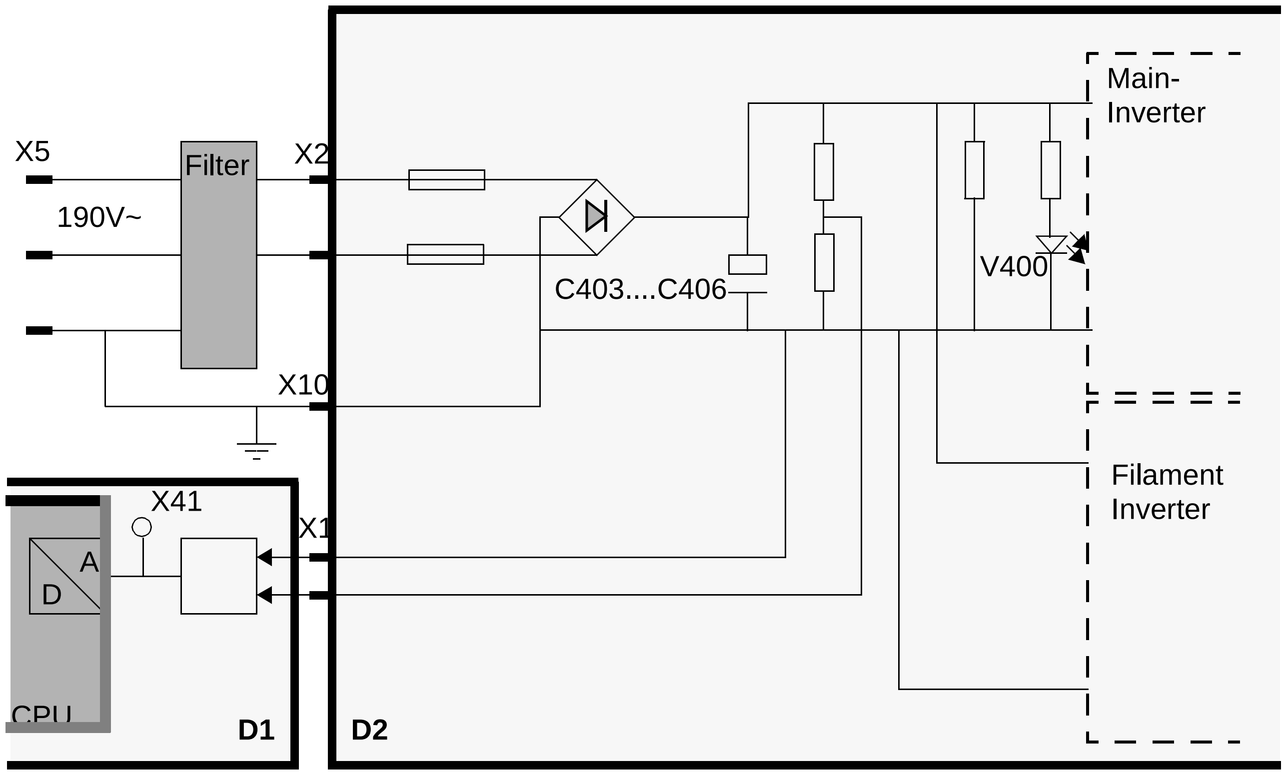
Main Inverter

The main inverter converts the intermediate circuit voltage to AC voltage. During this process, the high voltage is regulated via the inverter frequency. The high voltage regulator is lcoated on board D1.

Filament Inverter

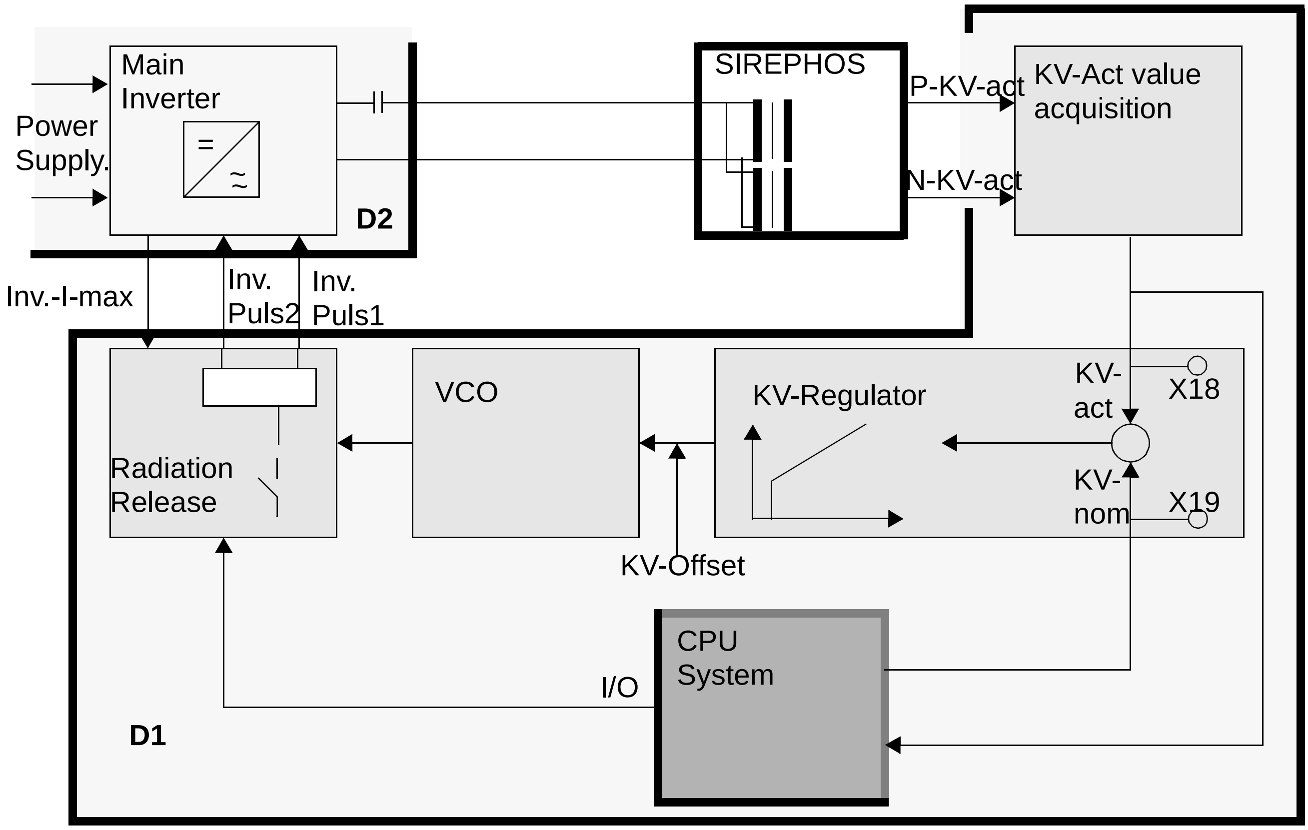
The intermediate circuit also supplies approximately +266V +/-10% to the filament inverter. This voltage is converted into an AC voltage signal , regulated and and goes via the filament transformer in SIREPHOS to the X-ray tube filament.

Intermediate Circuit



The intermediate circuit delivers a stable DC voltage to supply the output components of SIREMOBIL Compact. For this purpose, the 190 V AC are rectified on board D2 and the capacitors C403 to C406 are charged. If the SIREMOBIL Compact is switched off, the capacitors are discharged by a resistor. The discharge time is approximately 2 minutes. LED V400 indicates whether the intermediate circuit output voltage is higher than 50V. The actual value is acquired via a voltage divider and converted into a digital value on board D1. This digital actual value is compared with actual values stored in the Host computer for error detection. The analog actual value of the intermediate circuit can be measured at test point X41 on board D1 where 1V actual value equals 50V of intermediate circuit output voltage.

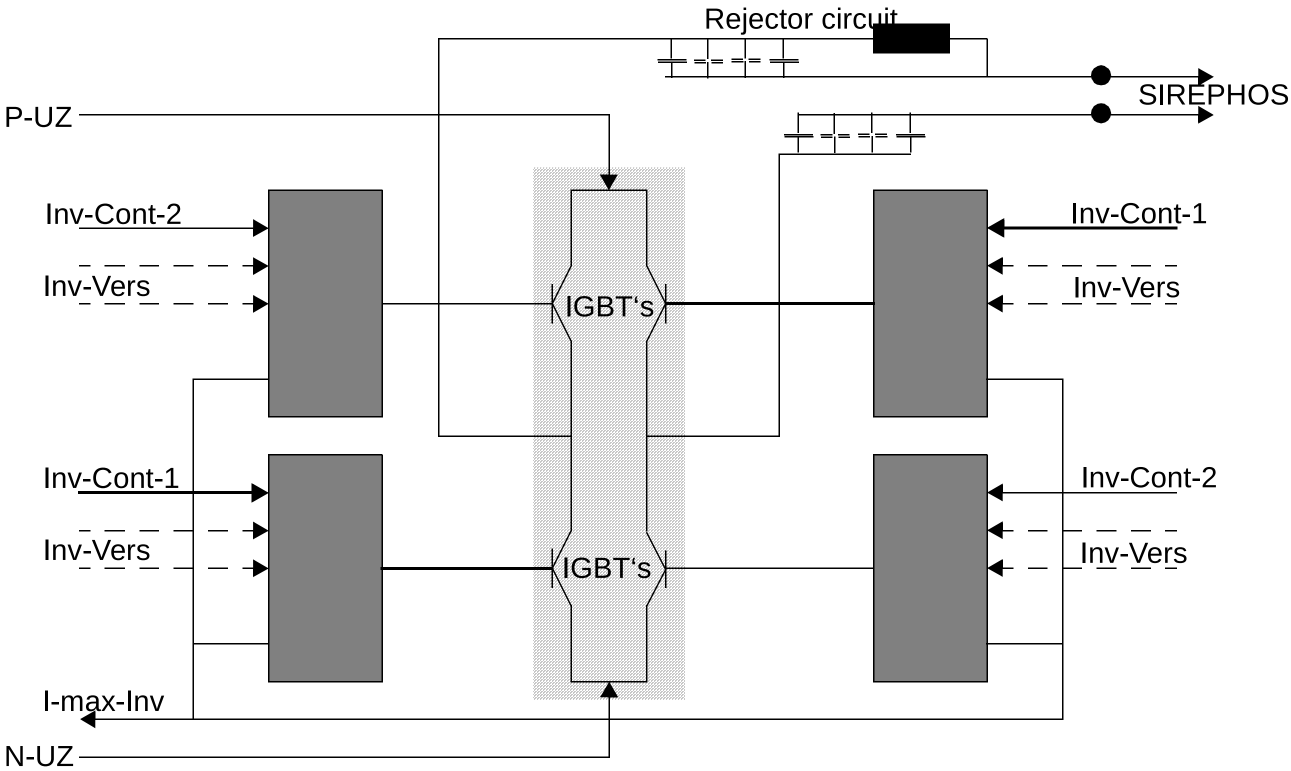
KV Regulation



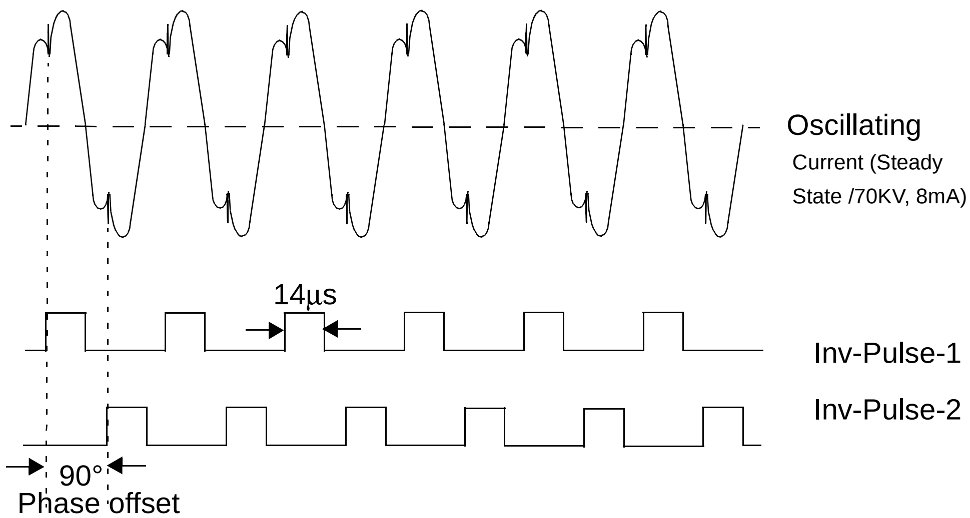
The SIREMOBIL Compact regulates the KV via the main inverter. The high voltage is controlled via the Inv-Puls 1 and Inv-Puls 2 signals that are in a frequency range of 15KHz to 35KHz. The KV-actual value, which is determined from the differential measurement between P-KV-Act and N-KV-Act in the KV-actual acquisition, is compared with a KV nominal value supplied by the host computer. Both values can be measured at test points X18 (act) and X10 (nom) whereby a value of 1V corresponds to 20 KV actual value. The KV actual value is also transmitted to the Host computer via monitoring. The KV regulator has a PI characteristic with a resettable I- (integral) portion. Depending upon the difference between the KV nominal and KV actual, the regulator supplies a control voltage for the VCO that generates a corresponding clock signal. The input voltage for the VCO ranges from 0 to 10V and controls the output frequency within a range from 30 to 70 KHz. This control signal is enabled in the following stage when radiation is ON.

The KV Offset is adjusted during the generator learning phase.

Main Inverter

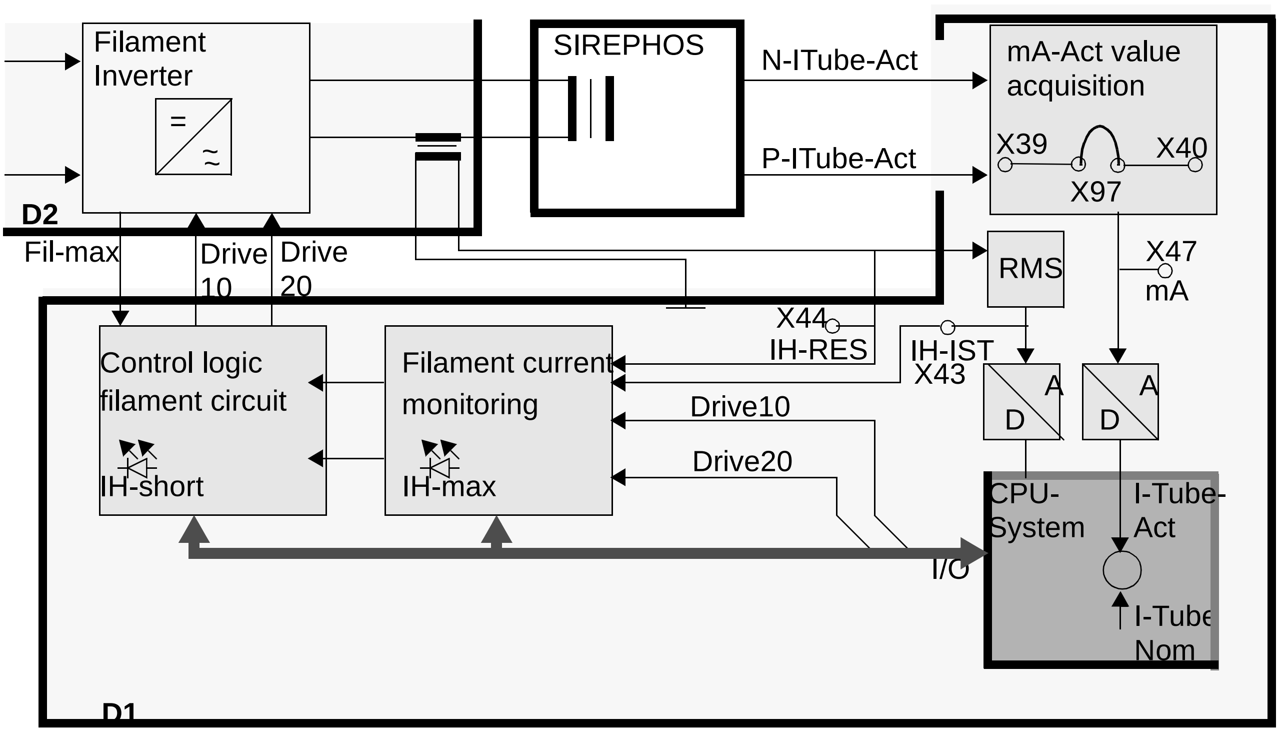


The inverter drive signals , Inv-Cont-1 and Inv-Cont-2, are in a frequency range from 15 to 35 KHz and have a constant pulse width of 14 µsec. These pulses control the respective IGB transistors (isolated gated bipolar) diagonally opposite , whereby the polarity of the resonance circuit from the oscillating circuit capacitors, the high voltage transformer and the rejector circuit are reversed. The high voltage for the X-ray tube is produced by recharging the capacitors of the two secondary voltage doubler circuits.



Relationship between regulation, oscillation and high voltage.

Filament Circuit



The DC/AC converter is located on power supply module D2. The actual value acquisition on board D1 generates the actual value for the tube current regulation from the signals delivered by SIREPHOS, N-ITUBE-Act and P-ITUBE-Act (in Stand-by mode the Siremobil switches to filament circuit regulation). The actual value is converted to a digital value and compared via the CPU with a nominal value. From these values, an ASIC circuit produces the corresponding control signals Drive 10 and Drive 20. The filament current is regulated by the frequency of these control signals, which ranges from 20 to 43 KHz. If the maximum allowable filament circuit current is exceeded, control signals Drive 10 and Drive 20 are blocked by the filament circuit monitor.

VIDEOMED DC TV System

Overview

The SIREMOBIL Compact TV system is called VIDEOMED-DC. All assembly modules with the exception of the power supply, are located on a board that is installed in the I.I. housing. In case of defects, the entire TV board must be replaced. The VID-DC is a self-adjusting system and no adjustments to the camera electronics are required.

The VID-DC

- is a standard resolution CCD TV system corresponding to the CCIR (625 lines / 50Hz) or EIA standard (525 lines/ 60Hz).
- delivers a standard output signal of 1Vpp to a 75 ohm terminator resistor. The vertical synchronization corresponds to 50Hz or 60Hz.
- generates an actual value for the dose rate control and the automatic gain control that is derived from the B-signal.
- is a self-calibrating and self-testing TV system.
- is CPU controlled.

Optics

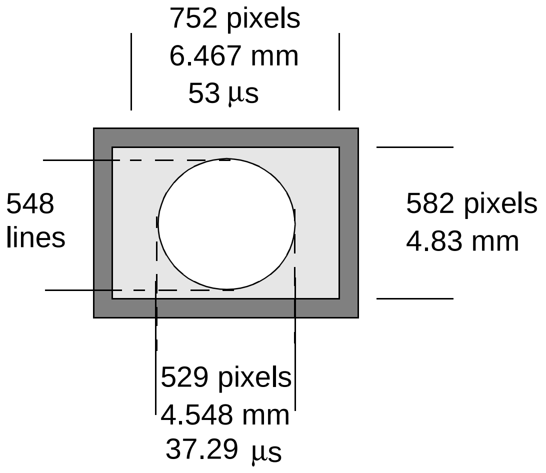
The VID-DC is adapted to the I.I. by means of optics with a manually adjustable iris collimator.

Depending on the type of I.I. installed, (17cm or 23cm), there are two different optics for the VID-DC. Optical sharpness can be set by means of an adjustment wheel. The optics are integrated in a rotating mechanical frame, so that the entire TV unit can be rotated. The angle of rotation is +/- 220°(+/-2°) and is displayed on the control panel. Positioning is controlled by the Host computer and the motor control is located on board D1.

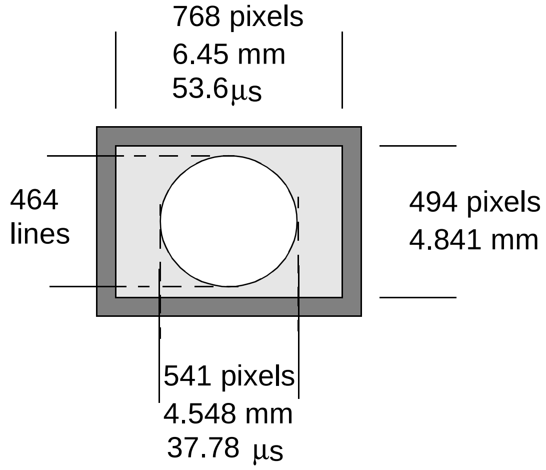
CCD Sensor

The CCD sensor converts the optical image signal that comes from the image intensifier into an electronic image signal.

50Hz CCD sensor



60Hz CCD sensor



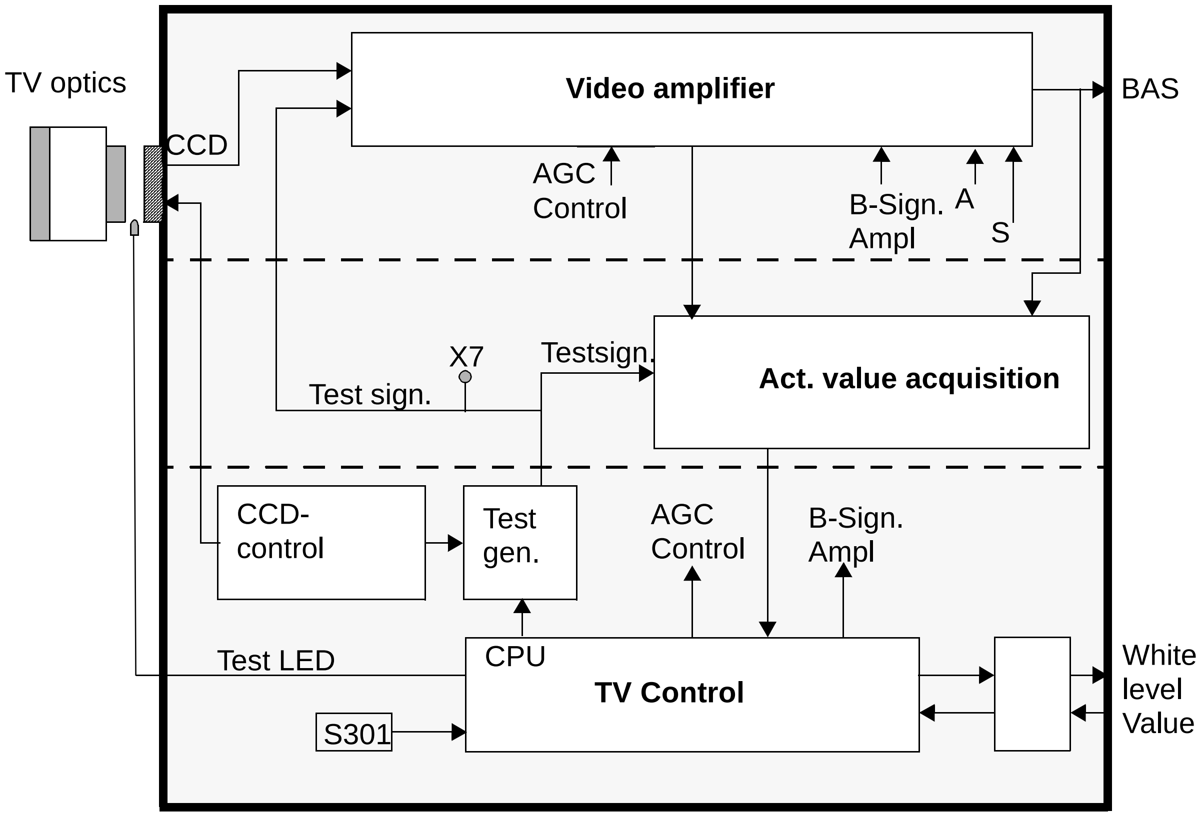
The CCD sensor used by the VID-DC works according to the Interline-Transfer -Principle. The image that is projected via the optics to the CCD sensor, produces charges in the individual pixels of the CCD sensor, that correspond to the intensity level of the respective pixels. These pixel charges are taken over into the corresponding readout register during V- or H-blanking and transmitted to the video output of the CCD sensor. The voltage across the video output resistor corresponds to the pixel charges. All voltage values together produce the video signal.

Two different CCD sensors are used because different matrix sizes (refer to the illustration) are required for 50 Hz or 60 Hz. For this reason, two different hardware designs are used for the VID-DC.

A test LED is used to check the functionality of the CCD sensor.

The CCD sensor is cooled by means of a copper layer that is attached directly to the CCD sensor. The sensor temperature should not exceed 42°C, otherwise image quality may be adversely affected.

Block diagram



The VID-DC electronics consists of three main modules:

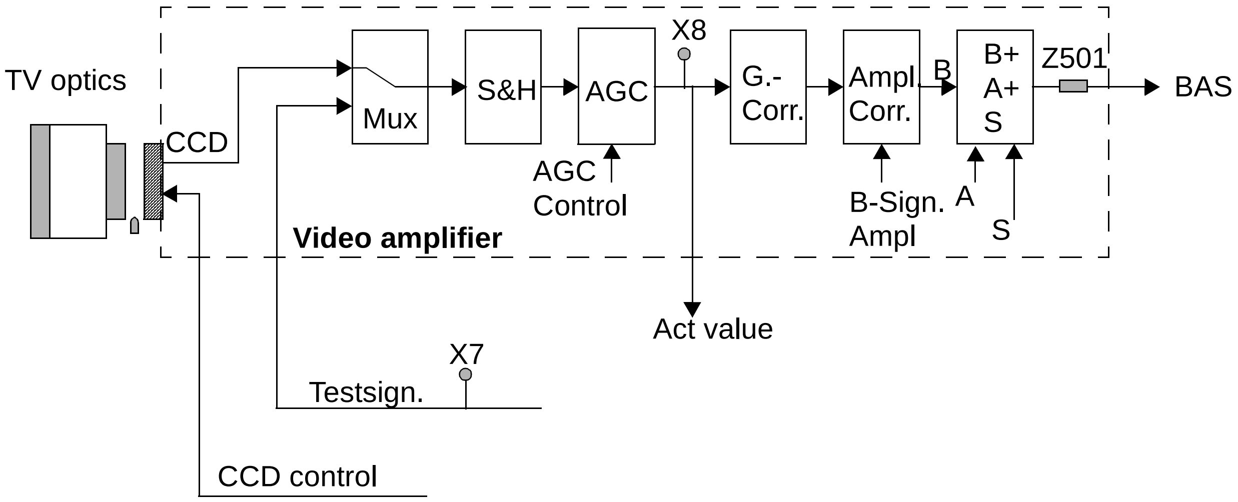
- the video amplifier
- the actual value acquisition
- the TV control

The video amplifier generates a BAS signal of 1Vpp to a 75 ohm terminator resistor from the analog B-signal supplied by the CCD sensor.

The actual value acquisition delivers an actual value to the dose rate control and the AGC.

The TV control provides the control signals for the TV function modules and forwards the "white level value" via the serial interface to the generator. The serial interface is used for communication between the Host computer and the TV system.

Video amplifier



Input multiplexer

The video signal from the CCD sensor is transferred to the video amplifier via the input multiplexer. When switching the system ON, it enters a self-testing phase during which it selects a test signal that is generated in the TV control. For service purposes, this test signal can also be programmed via the S301 service switch.

S&H Stage

The Sample & Hold stage samples the video signal in the pixel clock to ensure a continuous B-signal.

AGC Control Element

The AGC regulates the video amplifier. If the SIREMOBIL white level control cannot adjust the B-signal any further, the automatic gain control is enabled by the Host computer. The control dynamics of the AGC is 16 dB. The higher the gain, the lower the signal-to-noise ratio, since the noise portion of the B-signal is amplified as well. The image quality deteriorates depending on the gain factor. The control signal for the AGC is generated via the actual value acquisition and the ACG control circuit. The CPU of the TV control compares the digitized value of the actual value acquisition with a stored nominal value and in this way, produces a digital AGC control value. This control value is subsequently converted into an analog signal and sent to the AGC control element. As long as the dose rate control does not reach its maximum value, the AGC will retain a fixed amplification. The actual value is decoupled at the AGC output for the actual value acquisition.

Gamma correction

In order to increase the detail contrast for signal portions with low amplitude, the video amplifier of the VID-DC contains a gamma correction stage. This stage has a non-linear gain. The gain for the B-signal portions with low amplitude is higher than for high signal amplitude values. The gamma correction compensates in a certain sense for the non-linear characteristic of the monitor picture tube. In this way, the contrast ratio and the image quality is improved. The VID-DC has a fixed gamma of 0.7.

Amplitude correction

In this stage, the B-signal amplitude is corrected after switching the system ON in the subsequent self-test phase so that the B-signal portion of the BAS signal is 650m Vpp. and is used as a test signal.

BAS Mixer

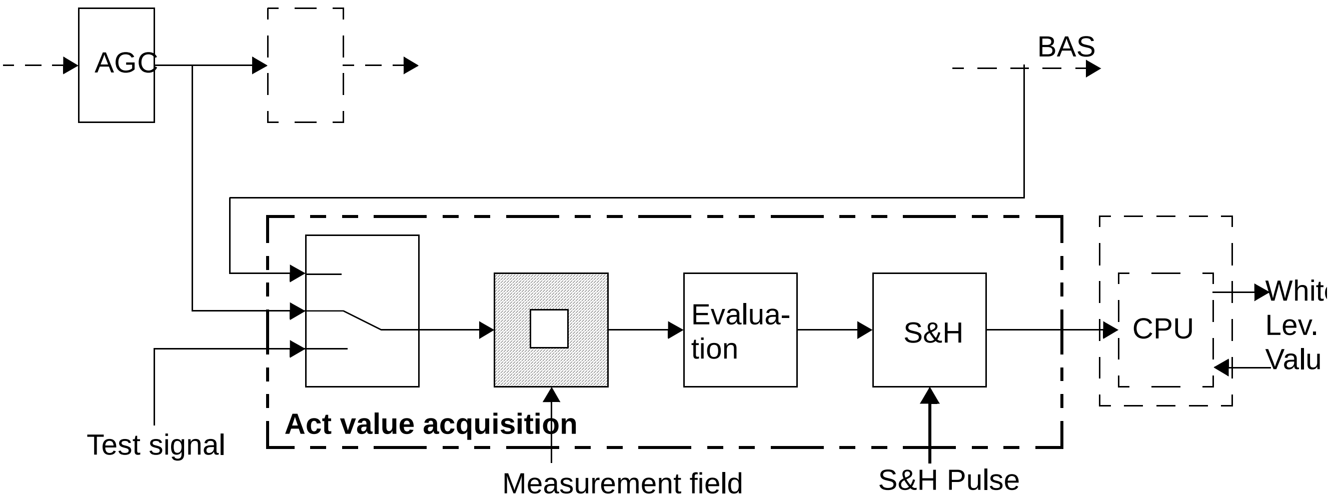
In the mixer, the B-signal, H and V blanking signals and the synchronous signal are combined so that the BAS signal is produced.

The amplification values of the individual signal portions are as follows:

B-Signal	650mVpp
Black level	50mVpp
Synchronous signal	300mVpp

These signal values produce the standard BAS signal of 1Vpp to a 75 ohm terminator resistor.

Actual value acquisition



In order to generate an actual value for the automatic dose rate control and for the AGC, the B signal is sampled from the video channel behind the AGC control element and switched to the actual value acquisition via a multiplexer. The multiplexer can select the test signal or BAS signal for other test and adjustment purposes.

Measurement field acquisition

Since the most important parts of the image are in the center section, the outside portion of the image is blanked during acquisition. A rectangular measuring field is used for this purpose. Only the B signal portions lying within the measuring field are forwarded for actual value generation and are able to influence the dose rate control or the AGC.

Evaluation

Since the actual value must be a DC voltage for the control components, the DC mean value of the B-signal is established with an integrator circuit in the evaluation module. On SIREMOBIL Compact there is only one evaluation mode, mean evaluation.

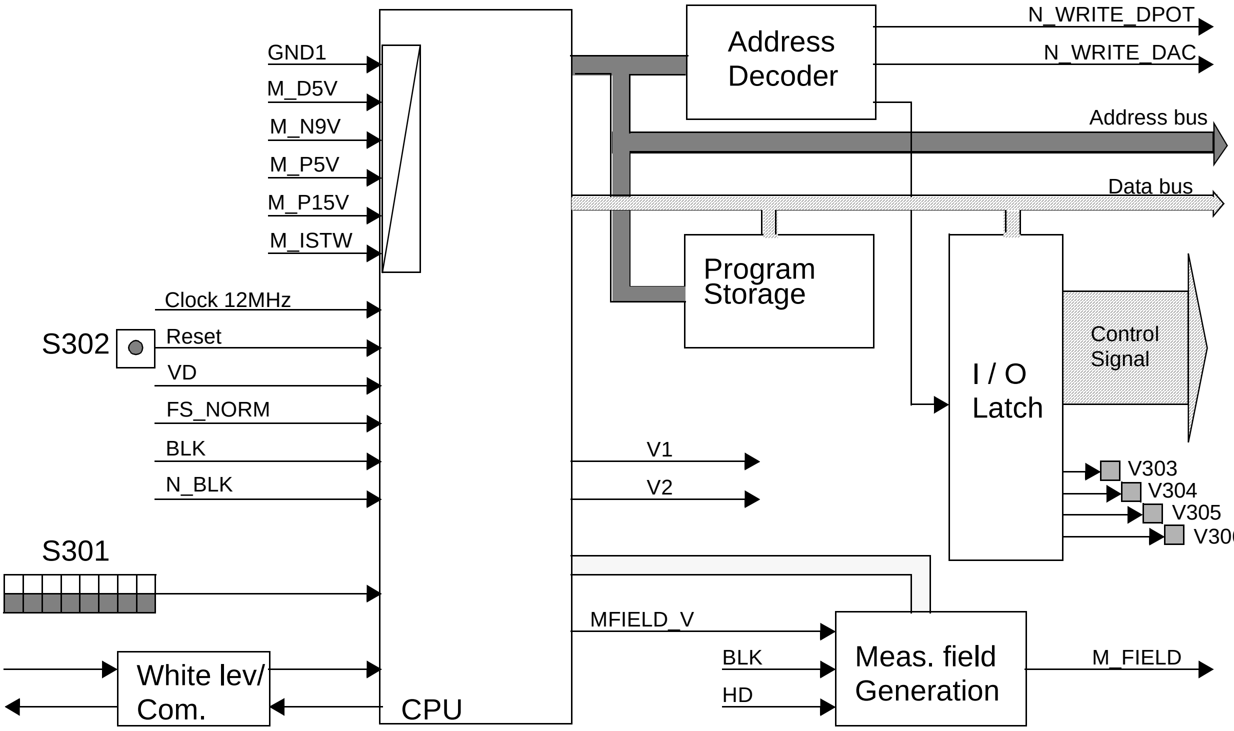
S&H stage

The DC voltage mean value generated in this way is stored in the S&H stage. The actual value is updated every 20 ms (50 Hz) or 16.66 ms (60 Hz) since the sample clock corresponds to the vertical clock . This analog actual value is forwarded to an A/D input in the control CPU and converted to an 8 bit digital value. The digital "white level value" is forwarded to the AGC and via the serial interface to the dose rate control.

Notice

If the actual value acquisition or the white level value malfunctions, radiation will be blocked in control mode.

TV control



A CPU, type SAB80C535 is used to control the TV functions. The control signals are output via the I/O Latch to the individual modules. The TV system software is stored in the program memory.

Measurement field generation

The rectangular measurement field used on the VID-DC is stored in memory. Various measurement fields corresponding to 50 Hz or 60 Hz are addressed by the CPU and forwarded to the actual value acquisition.

Serial Interface

The serial interface forwards the white level value and communicates with the Host computer. The "white level value" is forwarded to the generator in V clock. Communication between the Host and the TV system is enabled between the individual "white level " telegrams. The serial interface is physically configured as a 20 mA circuit.

Analog Inputs

The CPU has several analog inputs or internal A/D converters. Power supply voltages for the Power-up test are converted via these inputs. In addition, the analog actual value from the actual value acquisition is converted to a digital value, the "white level value".

S301 Service Switch

Various tests or control signals can be selected at service switch S301. For example:

S301	.1	.2	.3	.4	.5	.6	.7	.8
Normal position	off	off	off	off	off	off	off	off
Meas. field 1								
Meas. field 2								
AGC Request	x	x	on	x	x	x	x	x
AGC Stop	x	x	x	ein	x	x	x	x
Radiation ON	x	x	x	x	on	x	x	x
Test signal /AGC Cont. Element	x	x	x	x	x	on	off	x
Test signal /Act value acquisition	x	x	x	x	x	x	on	x
Test LED ON	x	x	x	x	x	x	x	on

Tab. 1

TV Initialization

The following tests and self-adjustments are run during the initialization phase:

- Power supply voltage check
- Actual value acquisition adjustment
- Manual gain adjustment
- Adjustment of the B-signal in the BAS-Signal
- Adjustment of the blanking signal in the BAS-Signal

When initialization is completed, the "white level value" is forwarded to the generator.

The TV system boot-up takes approximately 30 s.

After initialization, the actual value acquisition is checked every minute. If radiation is switched on during this time, the test is interrupted.

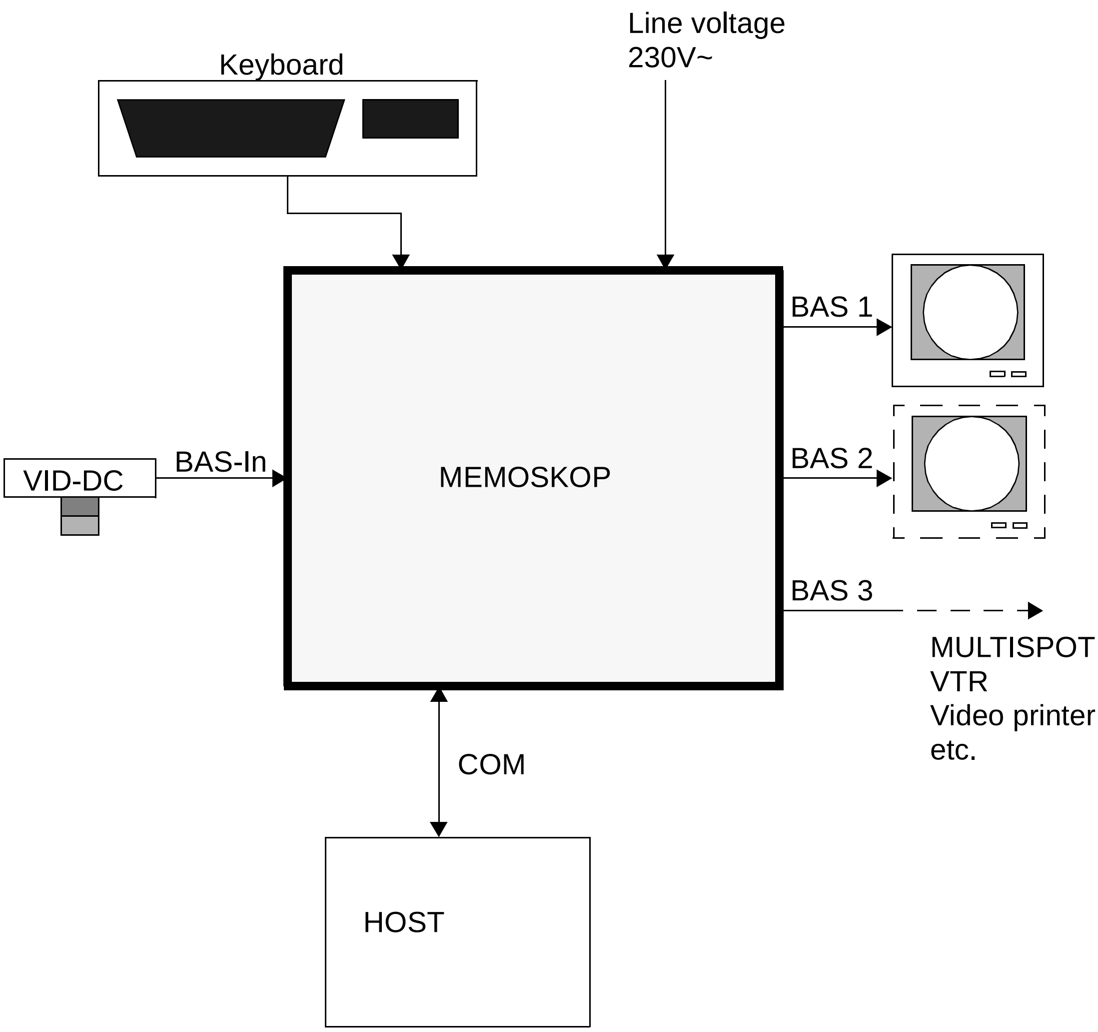
MEMOSKOP

The SIREMOBIL-Compact has various memory configurations.

Memoskop C-E for storage of 3 images

Memoskop C memory with hard disk memory for storage of 100 images

Cabling



Power supply

The MEMOSKOP is supplied with 230V AC current from isolation transformer T1 independent of the line voltage available.

Communication

The Host computer and MEMOSKOP communicate via a serial interface. This interface is physically configured similar to a 20 mA circuit. Time-critical signals, such as STARTmemory from the Host and the Acknowledge signal ACQUISITION from memory, are forwarded via their own 20 mA circuit.

BAS Input

The BAS signal that comes from the TV system is connected at the "VIDEO IN" connector. The BAS-signal terminates with a 75 ohm terminator resistor in the Memoskop.

BAS output Mon1 / Mon2

The BAS outputs for monitor1 or monitor 2 deliver a BAS-Signal with 1Vpp at 75 ohms and a vertical frequency that can be 50Hz,60Hz,100Hz or 120 Hz according to the configuration. Monitor1 displays the actual FL image or LIH image. Monitor 2 displays stored images.

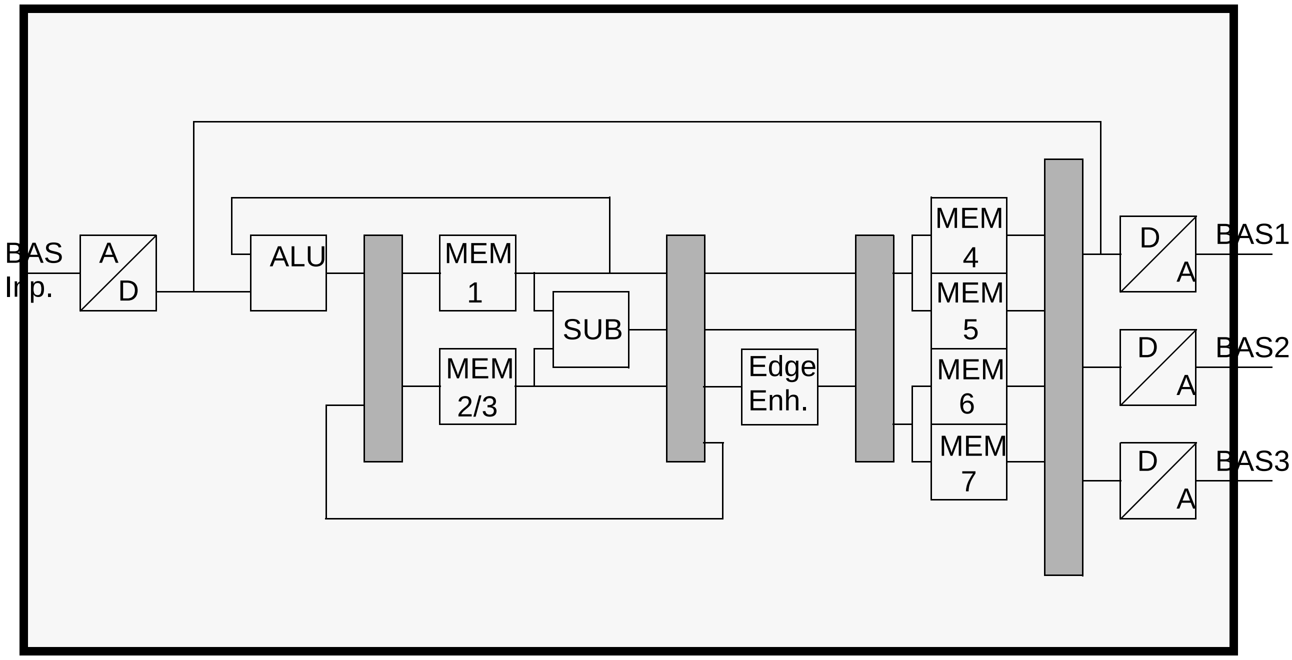
BAS output 3

At the BAS output 3, a BAS-signal of 1Vpp at 75 ohms is available with a vertical frequency of 50 Hz or 60 Hz for video components such as multiformat camera, video printer, video recorder etc.

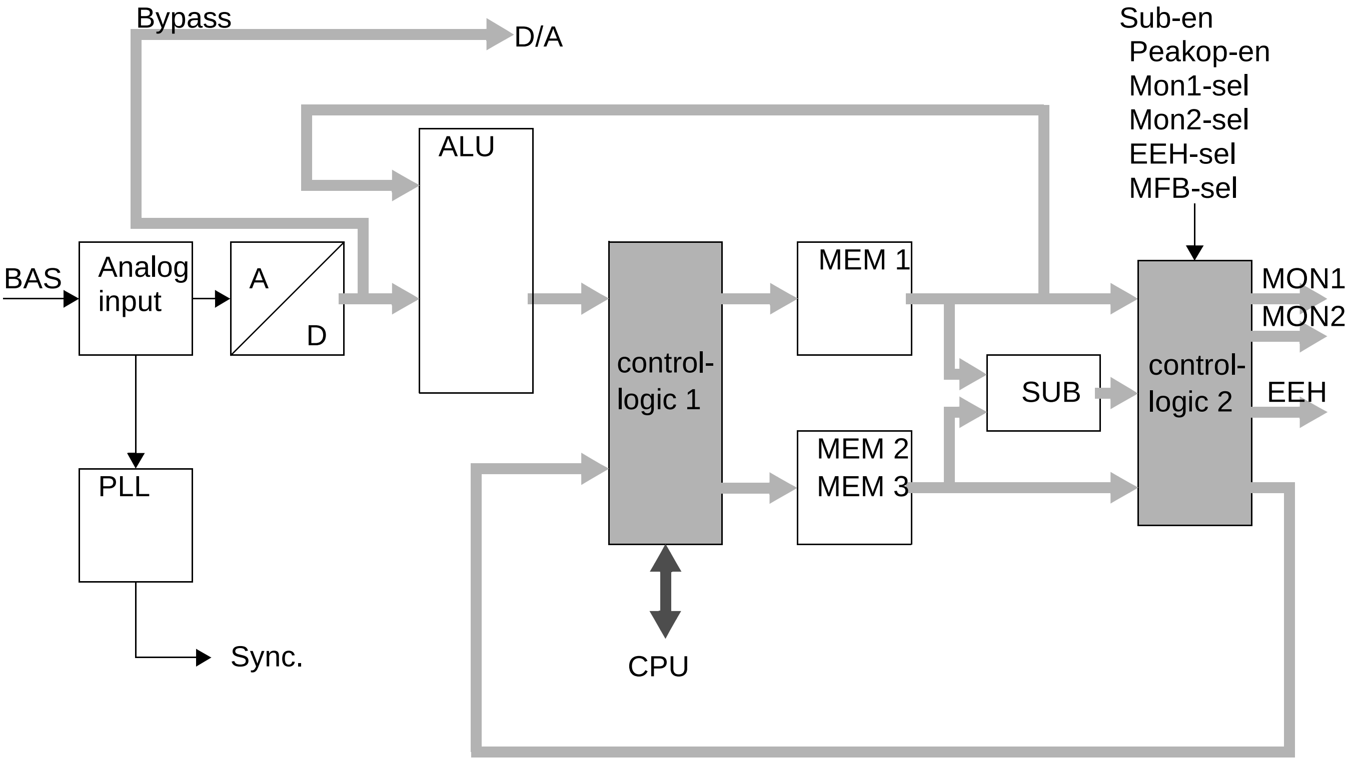
Keyboard

A Keyboard (optional) for entering patient data can be connected via an RS232 interface to the Memoskop "KEYBOARD" jack. Various keyboards are available depending on the country-specific character sets and the memory configuration.

MEMOSKOP 3000 block diagram



After the analog BAS input signal has been converted with the A/D converter to digital pixels from 8bit, the pixel values can be computed with an ALU (arithmetic logic unit). The ALU assists in noise reduction and motion detection. The MEM1 memory is the working memory for the ALU. The image data stored here are used by the ALU for processing. The completed images are stored in the MEM 2 and 3 complete image memory. The Edge Enhancement stage increases the contrast of the object edges. The processed image data of the current FL image are stored in the intermediate memories MEM 4 and MEM 5. In this process, the vertical frequency of 50 Hz (write) is translated to 100 Hz (read) or of 60 Hz to 120 Hz. MEM6 and MEM7 convert the stored image for monitor 2. The digital image data are converted back into analog output signals with the D/A converters.



Analog Input

The BAS-signal of 1Vpp generated in the TV system terminates at the analog input amplifier at 75 ohms. In this input amplifier, the synchronous signal portion is isolated from the BAS-signal and forwarded to the PLL for memory synchronization. In addition, the B signal is adapted here to the input range of the A/D converter. The blanking and synchronous portions of the BAS-signal are cut off so that only the B signal portion is digitally converted.

PLL

The PLL (Phase locked loop) synchronizes the internal frequency generator with the synchronous signal isolated from the BAS signal. From this it generates the frequency and synchronous signals for the memory.

A/D Converter

The A/D converter converts the analog B signal into an 8bit value. This process produces 256 gray levels.

Control logic 1

The image data are sent via these logic components and stored in MEM 1, MEM 2 or MEM 3 according to the selection (FL,LIH or stored image).

ALU (Noise reduction)

The ALU (arithmetic logic unit) is a computer component for calculating image data for sliding weighted averaging, summation and motion detection.

Sliding weighted averaging and summation are image integration types that assist in noise reduction. The image information of the output image is produced from several images. The number of images to be integrated can be selected on the control panel. Integration factors are: 1 (no integration) 2,4,8 and 16. If a larger integration factor is selected, no movement of the object being examined may occur, since otherwise the image would be blurred by the timed integration.

Sliding weighted averaging is used for standard fluoroscopy while summation is used in DR mode. The difference between both integration types is that for sliding weighted averaging, the information content is taken from the individual images, while for summation the weighting remains the same.

ALU (Motion detector)

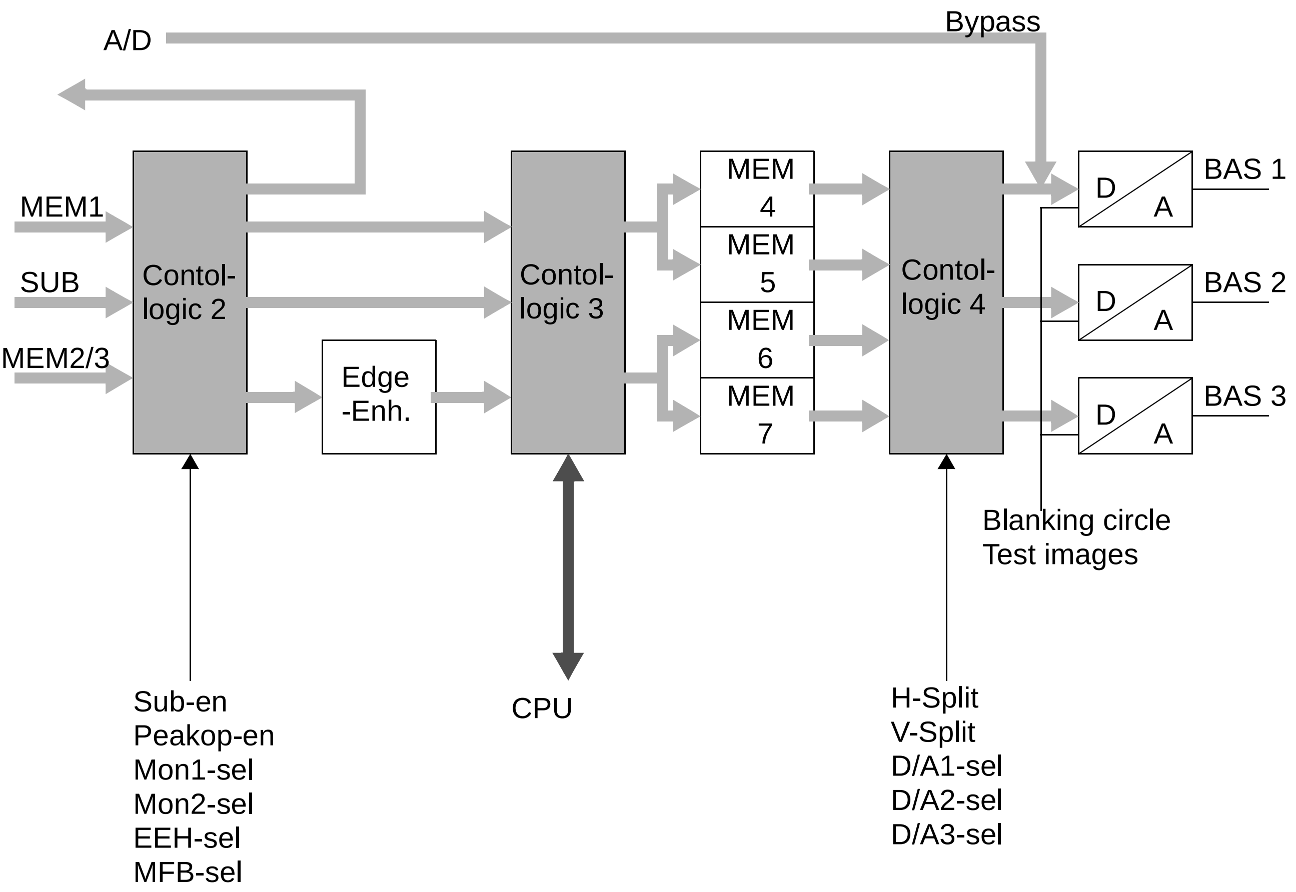
SInce image quality problems (blurred images) occur during integration of moving objects, the motion detection function can be selected on the control console. In this process, the pixel values of the existing image are subtracted from the pixel values of the new image. If this produces a differential value that is above a programmed threshold value, the noise reduction factor is decreased. The motion detection function is available for fluoroscopy only. Two motion detection factors can be selected for SIREMOBIL Compact.

Memory 1

Memory1 is the working memory for the ALU. This memory has a 512*512*12 matrix.

MEM2/3

The memory images for monitor 2 are stored in memory 2 and -3. The memory matrix is 512*512*8. Two stored images can be displayed on one monitor (horizontal or vertical) via a split function.



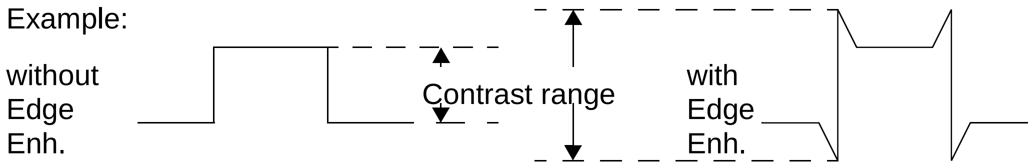
Control logic 2

The image data are forwarded via control logic 2 either directly or via the filter to edge enhancement.

Edge Enhancement

In order to increase the contrast impression, the pixel values can be modified at the image edges via digital spatial frequency filtration. To calculate the new pixel values, the surrounding pixel values are integrated. For MEMOSKOP, a core with a matrix of 5*5 is used.

Example:



Control logic 3

The image data are forwarded to the display memory via this logic component.

MEM4, MEM5, MEM6, MEM7

MEM4 to MEM7 each contain a half frame. The complete stored image for monitor 1 is located in MEM4 and MEM5 , and for monitor 2, in MEM6 and MEM7. The memories are subdivided into two areas. In this way, the image data for a half frame is written in the half of the memory with 50 Hz or 60 Hz V-clock frequency while the second half of the memory is read out at double V-clock frequency. In addition, the image data of the second half frame are written in the second memory half with standard V-clock frequency while the first half of the memory is read out with double V-clock frequency. The same process applies for MEM 6 and MEM7.

Control logic 4

This logic component forwards the image data to the D/A converters.

D/A Converter

The three D/A converters convert the digital image information back into an analog image signal. In addition, the blanking and synchronous signals are mixed via special inputs. A circular blanking signal is generated for this purpose in the MEMOSKOP. The text data are also combined into the image signal in this phase.

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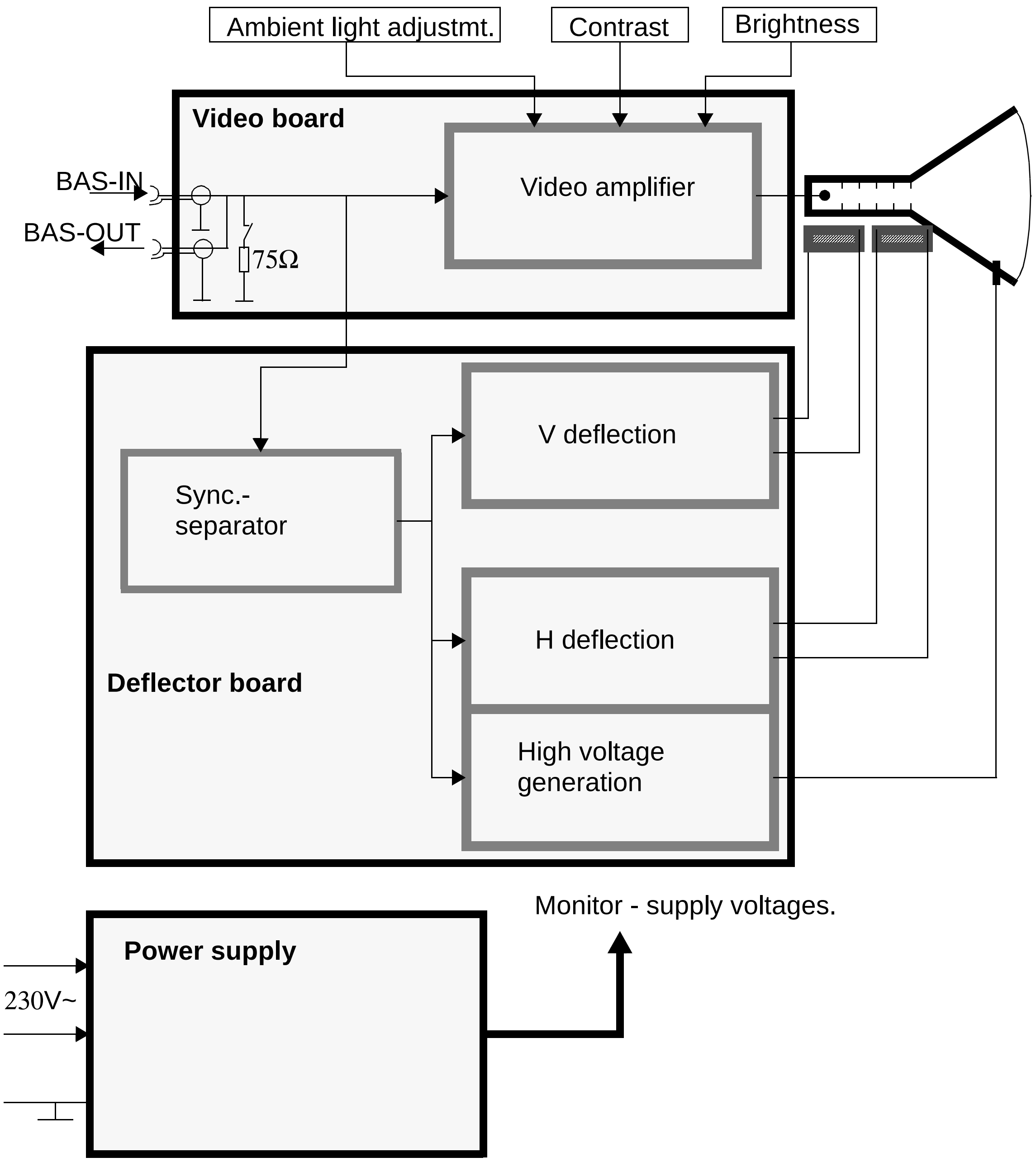
SIMOMED 90 N

Overview



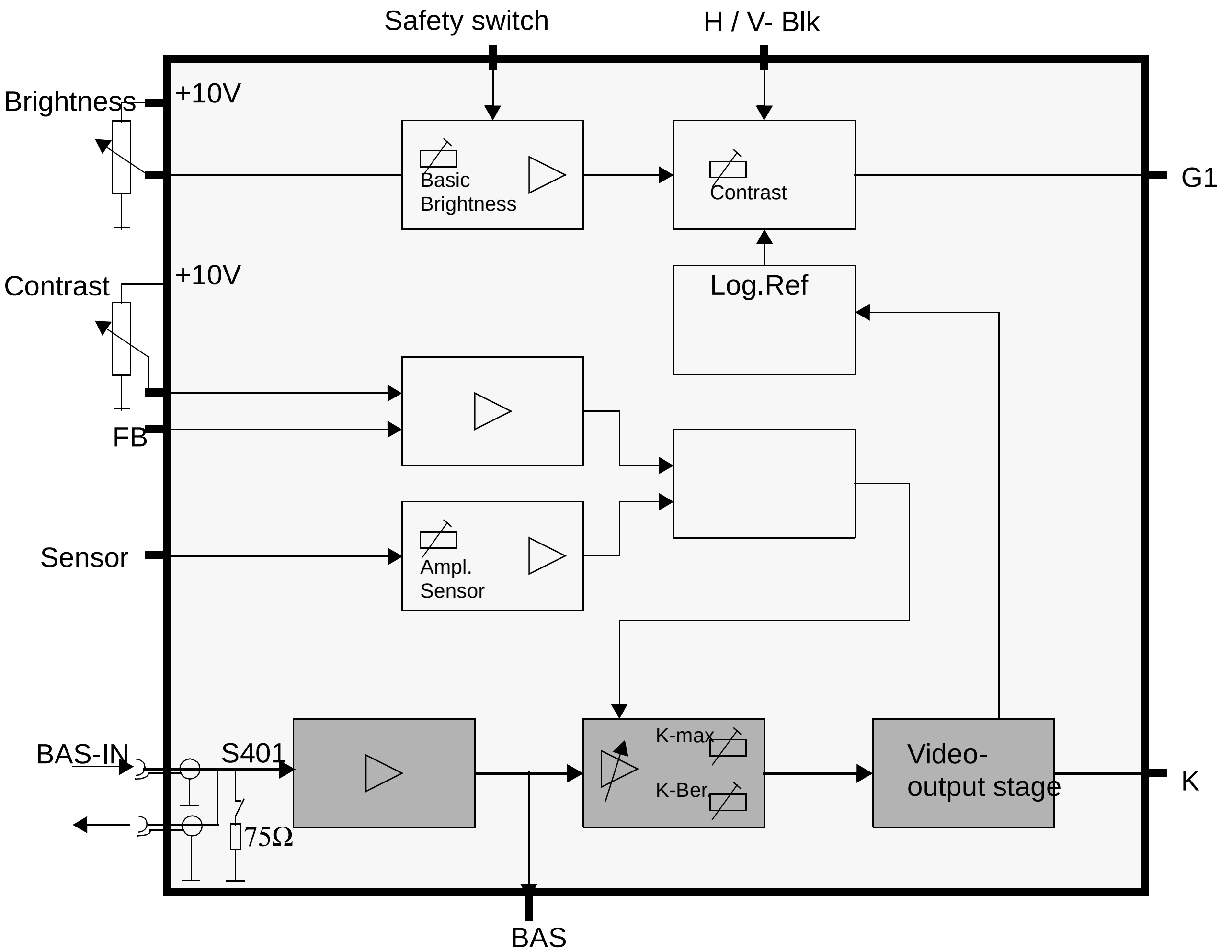
Three main boards are located in the SIMOMED monitor, the video amplifier board, the deflector board and the power supply board. Monitor service is restricted to board replacement.

The supply voltages for the monitor are generated on the power supply board.

All components necessary for horizontal and vertical deflection of the electron beam in the picture tube are located on the deflector board. In addition, this board generates the high voltage for the picture tube.

The video amplifier amplifies the BAS signal provided by the digital memory device at an amplitude of 1Vpp.

Video board

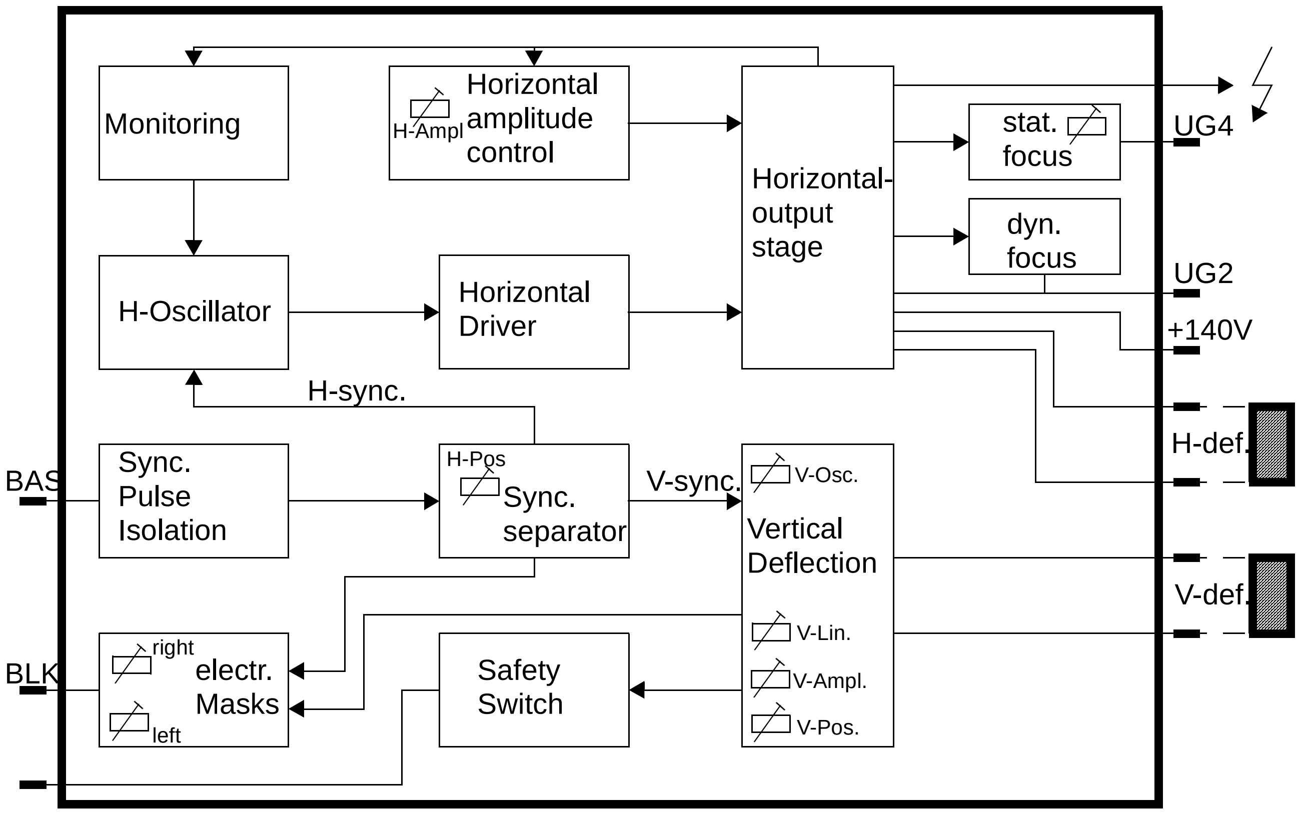


The following functions are on the video board:

- Video signal amplification at the required cathode level for the picture tubel
- Contrast regulation
- Brightness regulation
- Blanking value clamping (with/without)

The BAS-signal from the image memory is sent to the video board via the BAS input jack and can be terminated at a 75 ohm resistor. If the BAS-signal is being forwarded, it can be looped through the BAS output jack. If this is the case, the terminator resistor must be switched off with S401. The video signal is amplified to cathode potential with the amplification stages. The amplification factor can be changed with the contrast regulator and the ambient light adjustment sensor. In addition, the brightness regulation located on the video board, regulates the grid 1 voltage and also the brightness of the picture tube. The BAS-signal arrives at the cathode of the picture tube AC or DC-coupled via a video output stage (with / without blanking value clamping).

Deflector board



The deflector board has the following functions:

- Vertical and horizontal deflection of the electron beam in the picture tube
- Generation of high voltage for the picture tube
- Generation of grid 2 and grid 4 voltage (Focussing)
- Safety switch to protect the picture tube from burning if deflection malfunctions
- Generating an electric mask for blanking the image signal at the edge

Synchronous pulse isolation

The horizontal and vertical synchronous pulses from the BAS signal are isolated with a limiting circuit. In addition, the H and V synchronous pulses are separated from each other to control the H or V oscillator. If the synchronization signals fail, the oscillators continue to run so that rather than having the deflection fail, screen burn-in of the phosphor layer of the picture tube may occur instead.

Vertical deflection

The vertical oscillator generates a frequency that corresponds to the V synchronization, and which is forwarded to the next integrator. This integrator generates a vertical frequency, saw-tooth current, that is conducted via the output stage of the deflection unit vertical coil. The magnetic field of the V deflection coil deflects the electron beam in the picture tube in the vertical direction.

H Oscillator

The H oscillator generates a horizontal freqency to drive the horizontal output stage. The H oscillator is synchronized with the H synchronous pulse.

Horizontal power amplifier

In the H output stage, an H-frequency saw-tooth current is generated for the H-deflection coil of the deflection unit. This generates the magnetic field that is required to deflect the electron beam in horizontal direction. In addition, the high voltage for the picture tube is generated in the H output stage by transforming the line flyback pulse which is generated. In addition, the voltages for grid 2 and 4 of the picture tube (focussing the electron beam) are generated here. The H amplitude control regulates the picture width.

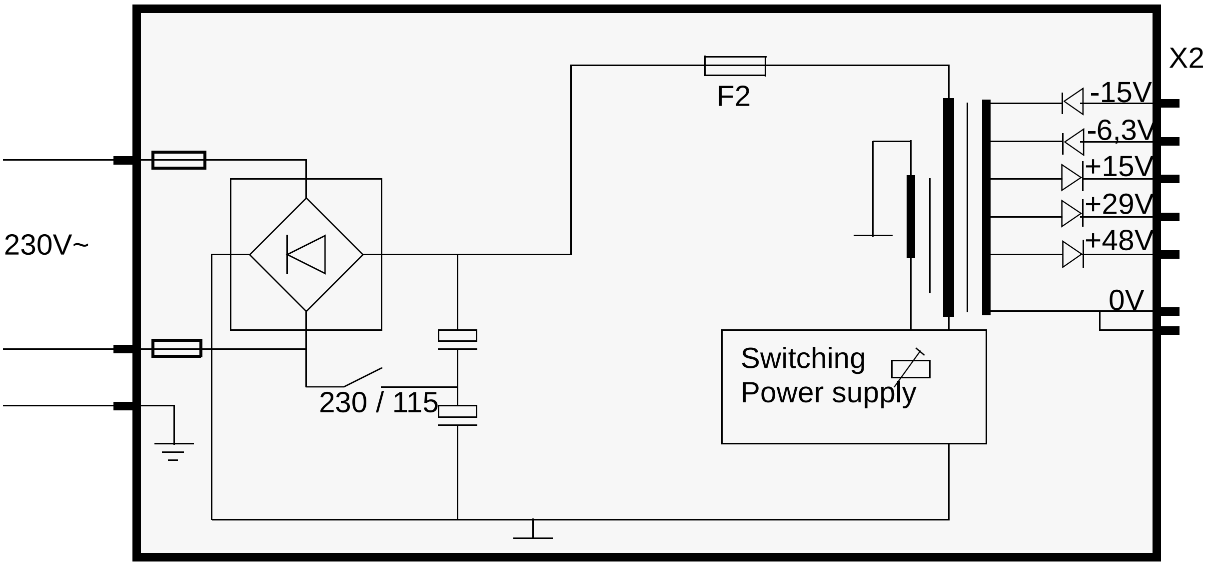
High voltage monitoring

For monitoring purposes, the high voltage actual value is broken down via a voltage divider and compared to a minimum value in the monitor. If this value is not attained, the H control is blocked. To restart it, the system must be reset.

Electronic Masks

Masks for blanking can be individually set on the right or left of the monitor.

Power supply board



The supply voltages for the monitor are generated on the power supply board with a primary controlled switching power supply. The switch frequency of the power supply is 25 KHz. Supply voltages of +/-15V; +29V; +48V and 6.3V (picture tube filament) are generated.

TDF 3 / Wicke

SMS, ISELIN / O'Donnell

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